

# ***GALLIPOLIS LOCKS AND DAM***

**OHIO RIVER BASIN**

**MASON COUNTY, WV**



**FOUNDATION REPORT**

**VOLUME 1**

**CONSTRUCTION OF TWO PARALLEL LOCKS AND CANAL**

**CONTRACT DACW-69-88-C-0001**

**23 JANUARY 1993**

**19970408 031**



**[DTC QUALITY INSPECTED 3]**

**U.S. ARMY CORPS OF ENGINEERS**

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## REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS N/A		
2a. SECURITY CLASSIFICATION AUTHORITY --			3. DISTRIBUTION / AVAILABILITY OF REPORT  DISTRIBUTION IS UNLIMITED		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE --					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) --			5. MONITORING ORGANIZATION REPORT NUMBER(S) --		
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Corps of Engineers Huntington, WV 25701-2070		6b. OFFICE SYMBOL (If applicable) CEORH-CD-I	7a. NAME OF MONITORING ORGANIZATION --		
6c. ADDRESS (City, State, and ZIP Code)  502 Eighth Street Huntington, WV 25701-2070			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION --		8b. OFFICE SYMBOL (If applicable) --	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER  DACW69-88-C-0001		
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
			WORK UNIT ACCESSION NO.		
11. TITLE (Include Security Classification) Gallipolis Locks and Dam, Ohio River Basin, Mason County, WV, Foundation Report, Construction of Two Parallel Locks and Canal					
12. PERSONAL AUTHOR(S) Drown, Larry M.					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM 1987 TO 1993		14. DATE OF REPORT (Year, Month, Day) 97 03 28	
15. PAGE COUNT 1755 4 Volumes					
16. SUPPLEMENTARY NOTATION Report prepared and distributed in accordance with ER 1110-1-1801, Change 2, dtd 1 Apr 83					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Foundation Exploration, Site Excavation, Foundation Excavation, Slurry Wall, Dewatering, Cofferdam, Foundation Treatment, Anchor Bars		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Description of the geology of the Gallipolis Locks and Dam site and a discussion of how the existing foundation conditions is the purpose of this report. The Gallipolis Locks and Dam is on the Ohio River at mile 279.2 near the town of Gallipolis, Ohio. Geologically, the area lies in the Kanawha section of the Appalachian Plateau Physiographic Province. The Pennsylvanian Age Rocks are mostly sandstones, shales, claystones, coals and siltstones. The principal features of the project are two adjacent, parallel lock chambers constructed as conventional concrete gravity-wall structures founded on rock. The report describes in detail the procedures used to establish foundation grades, and to excavate and treat the foundations. Pertinent correspondence relating to foundation conditions along with typical foundation treatment photographs is included. Geologic cross sections, foundation treatment profiles and boring logs are part of this report.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION --		
22a. NAME OF RESPONSIBLE INDIVIDUAL GORDON M. BUTLER, JR., Chief, Construction Div			22b. TELEPHONE (Include Area Code) 304-529-5254		22c. OFFICE SYMBOL CEORH-CD

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## **SECTION I**

### **INTRODUCTION**

#### **1.01 Purpose of Report**

The purpose of the this report is to insure the preservation, of the complete records of the foundation conditions encountered during construction and the methods used to adapt structures to these conditions.

#### **1.02 Scope**

The scope of this report covers the investigations, observations and treatments that were relative to establishing sound foundations for all structures erected for the Gallipolis Lock Replacement Project under contract DACW-69-88-C-0001.

#### **1.03 Construction Authority**

The authority for construction of Gallipolis Locks Replacement was granted under Water Resources act of 1986 ( PL-99-662 ).

#### **1.04 Project Location**

The project is located in the Middle Ohio Valley at Ohio River Marker 279.2. This indicates that the project is 279.2 miles below or downstream of Pittsburgh Pennsylvania. A closer Monument Marker is the Kanawha River. The Project area is fourteen miles below the mouth of the Kanawha River. The new Locks are located on the West Virginia side of the Ohio River, in a canal. The existing locks are adjacent and parallel to that position.

(For a location map see Section XIV Exhibit #1.)

### **1.05 Project Description**

The description of the Locks is as follows: Two adjacent, parallel lock chambers located in a canal directly east of the existing locks. The lock walls are a conventional concrete gravity-wall structure founded on rock. The Main Lock Chamber has a clear dimension of 100 x 1,200 feet and the Auxiliary Chamber 100 x 600 feet. The Main Lock location is west of the Auxiliary Lock. The Upper Approach wall is 1,200 feet long, measured from the upstream nose of the Middle Wall. The Lower Approach Wall is 1,000 feet in length, measured from the downstream nose of the Middle Wall. The Lower Approach Wall is founded on sheet pile cells, filled with concrete. The Middle Wall is 1,940 feet in length. The Land Wall is 1,292 feet in length. The upstream and downstream entrances use structural steel Miter Gates with hydraulically operated Gate machinery. A double leaf, vertical lift, submersible gate, electrically operated is located upstream from the Miter gate. The elevation at the top of the Lock Walls is 560 feet above sea level.

(For a Site Plan See Section XIV Exhibit #2.)

### **1.06 Project History**

The original or existing Gallipolis Locks and Dam were completed in 1937. It was the last project in the original system. The Ohio River, modernization program began in the late 1950's. Upon completion, it replaced three older locks on the Ohio River and three on the Kanawha River. The Navigational pool extends 41.7 miles up the Ohio River and 31.4 miles up the Kanawha River. Inspections conducted in the 1970's found the navigational locks to be in fair condition. The concrete walls are progressively deteriorating and slight misalignments of some wall monoliths were observed. Due to the increased wear resulting from frequent operation of the lock chambers, some equipment and gates are estimated to need replacement in ten years. Rehabilitation of the existing structure was economically feasible. However, due to the increasing size of the barge tows, a new locking structure was decided upon. The new structure has a 1,200 foot Main Chamber and a 600 foot Auxiliary Chamber. The locks are located in a bypass canal. The dam will be rehabilitated upon completion of the locks. This was considered the best plan, because it allowed for the passing of traffic in a safe and efficient manner and for improving overall navigation performance. Construction of the new locks began on 22 November 1987 and was beneficial occupancy on the 23 January 1993.

### **1.07 Contractor**

The prime contractor for the construction of Gallipolis Locks was a consortium of four companies. At the start of construction, the sponsor was S.J. Groves and Sons. The other partners were: Guy F. Atkinson Construction Company, Dillingham Construction Company and Harbert International. The consortium did business as GLR, (Gallipolis Lock Replacement) P.O. box 1267, 10000 Highway 55 West Minneapolis Minnesota 55440. On 28 October 1989, Guy F. Atkinson Construction Company assumed the sponsorship of the project. S. J. Groves and Sons remained as a partner. The contract was awarded on 21 November 1987.

(For a list of composite contractor personal see Section XI, page A.)

(For a list of subcontractors see Section XI, page B.)

### **1.08 Contract Supervision**

This contract was performed under a Contractor Quality Control Program. The Quality Assurance Program was conducted through a Government Resident's Office located at the construction site. This office was administered by a resident engineer acting as legal representative of the contracting officer (Col. Robert D. Brown) District Engineer. Due to the work load, the Resident Engineer's Staff varied during the construction program.

(For a composite list of Government Personal see Section XI, page C.)

## SECTION II

### FOUNDATION EXPLORATION

#### **2.01 Investigation Prior to Construction**

Investigation prior to construction began in 1964 and ended with the awarding of the present contract. These investigations were performed to evaluate the foundation characteristics and to determine the amounts and types of construction material present at the site.

#### **2.02 Soil Investigation**

The soil investigation during these programs consisted of 149, two inch, split spoon, standard penetration test samples. Twenty-two samples were either four inch or six inch diameter sample tubes and were sampled using a cable tool drill. Nine undisturbed samples were taken by fixed piston. All soil samples were visually classified in the field. Selected samples of both disturbed and undisturbed types from the excavation site were sent to the ORDL (Ohio River Division Laboratories) for testing. The test consisted of the following: Visual classification, Water content, Atterberg Limits, Specific Gravity, Q and R. Triaxial and S. Direct Shear.

#### **2.03 Rock Investigation**

The bedrock investigation in the area of the proposed structures was accomplished by drilling four inch and six inch diameter cores. The drilling was done on 250 foot centers along the wall alignment. NX size cores were taken and used to supplement the data from the larger diameter core holes. The four foundation rock types found are: Sandstone, Siltstone, Shale, and Claystone. Sandstone and siltstone are foundation mediums in the downstream area. In

the Auxiliary Chamber, North of the Miter Gate, the rock starts to transition into an interbedded Claystone and Shale. The Claystone and Shale serve as foundations for the upstream portion of the monoliths. Typical cores representing these four foundation rock types were shipped to ORDL (Ohio River District Laboratories) for testing. All samples were tested according to the United States Army Corps of Engineer's Rock Testing Handbook.

The following types of test were performed on samples of the four rock types: Direct Shear with Sliding Friction and with Deformation Readings, Unconfined Compression tests, Unit Weights, Moisture Content and Specific Gravity. Also Rock-on-Rock Sliding Friction tests and Grout-on-rock Bond Strength tests were performed. All rock samples were tested except for Indurated Clay. Indurated Clays were not used as a foundation medium.

(The detailed results from the above Rock and soil sample testing can be obtained from Design Memorandum NO.1, NO.2, NO.3 and Results of Direct and Cross-Bed Shear Testing of Rock cores, November 1984)

### **2.03.a Rock Test Results**

Problems. Most of the problems associated with the rock testing program were related to either sample selection or the integrity of the indurated clay and claystone samples. Sample selection was complicated by the gradational nature of the siltstones and claystones and the indurated clays. The upstream portions of the lock structure are founded on a rock type classified as interbedded claystones and siltstones. While the claystones and siltstones are interbedded, they do not occur at consistent elevations from hole to hole. The individual beds appear to be in a constant state of gradational change or may exist as a series of "pods" or lenses. Due to the nature of these beds, there is no certainty that all the samples selected for an individual rock type are truly representative samples. This condition is mitigated somewhat by the fact that the claystones are obviously the weaker of the two interbedded rock types. Thus, the samples selected for testing from the interbedded materials were claystones.

Sample integrity was a problem for both the claystones and indurated clays. A large number of samples for the compression and shear tests were rendered unusable during transportation from the field and during transportation to the laboratory. Some samples were placed in PVC tubing and encased in plaster in order to reduce damage during shipment. While this

proved to be of benefit, some of the compression tests had to be corrected to account for sample lengths which were less than twice the sample diameter.

Interpretation of Test Results. It is recognized that the problems discussed above are indicative of the nature of the foundation materials. Problems such as these also indicate the need for conservative interpretation of test results since the samples are representative of the more competent portions of the foundation. As a result, the data from the testing was generally interpreted using statistical methods to identify a 90 percent lower-bound envelope. The lower bound represents an envelope which would lie below the linear regression line for nine out of ten testing programs in the same material. In some instances, the lower bound envelope was unreasonably conservative by virtue of the fact that little or no difference could be distinguished between the lower bound for the peak direct shear and the sliding friction tests. In these cases, which are identified by an asterisk in Table 1, a visually determined lower line of best fit was used for the interpretation. Since the design for a large portion of the project is controlled by the envelope for the interbedded material, additional testing is planned to confirm the design values for this material.

Allowable Bearing Pressures. The allowable bearing pressures exceeded the foundation pressures in all cases. The maximum foundation pressure for the lock structure is 20 KIPS or 138 psi. The minimum average unconfined compressive strength for any bed on which structures are founded is 1712 psi. (Table 1). Thus the bearing capacity, which is generally accepted to be equal to the unconfined compressive strength, exceeds the foundation pressure by a factor greater than 10. The allowable bearing pressure used in the design was 50 KIPS (347 psi), which provides a safety factor of slightly less than 5.

Indurated clays do not serve as the founding medium, for any structure. Their presence in the foundation at depths which exceed 5 feet was noted, and an analysis was performed to determine whether transmitted pressures were within allowable limits. The analysis (after Goodman 1980) showed that the transmitted pressure was less than 20 psi. Since the average unconfined compressive strength of the indurated clay is 185 psi, a safety factor in excess of 9 exists without taking into account the effect of the confining pressures to which the material is subjected.

The access road bridge will be founded on piles driven to rock, and each pile will sustain a 50-ton load. The sandstone which will be present at top of rock has an average unconfined compressive strength of 4820 psi. In order for the unit load to equal this strength, a pile area of 20.7 square inches will be required. This type of approach disregards the confinement of the overlying

materials which will add significantly to the capacity of the foundation. For this reason, the selected pile will have an end area of approximately 20 square inches. Pile caps may be used to increase the end area, depending on the strength required for the steel piling.

TABLE 1

## ROCK TEST SUMMARY FOR GALLIPOLIS REPLACEMENT LOCKS

ROCK TYPE	SHEAR TEST (90% LOWER BOUND )						COMPRESSION TEST AVERAGE	
	PEAK DIRECTION		SLIDING FRICTION		GROUT ON ROCK		UCC	YOUNGS MODULUS
	0	C (psi)	0	C (psi)	0	C (psi)	0	XIO (PSI)
SANDSTONE	42 DEG.	42	44 DEG.		56 DEG.	11	4820	1.04
SILTSTONE	44 DEG.	33	22 DEG.	20	29 DEG.	11	6113	1.13
CLAYSTONE	*14 DEG.	* 35	23 DEG.	8	33 DEG.	8	1712	0.4
INDURATED CLAY	*22 DEG.	* 4	29 DEG.	2			185	0.04

## DESIGN VALUE SUMMARY

ROCK TYPE	SHEAR TEST (90% LOWER BOUND )					
	PEAK DIRECTION		SLIDING FRICTION		GROUT ON ROCK	
	0	C (psi)	0	C (psi)	0	C (psi)
SANDSTONE	45 DEG.	50			56 DEG.	11
SILTSTONE	40 DEG.					
INTERBEDDED CLAYS & SHALES			23 DEG.	8		
INDURATED CLAY	12 DEG.	5				

NOTE:

\* VISUAL LOWER LINE OF BEST FIT

LMD

## **2.04 Investigation During Construction**

During the construction, investigations that were performed can be divided into visual and physical. The Visual investigation was the continuous observation of conditions that were exposed during excavation. These new conditions were then compared to the interpretations and conclusions derived from previous exploratory programs. These interpretations were then verified or the design revised to fit the existing conditions. Inspections were conducted by personnel from the District and Division Offices. The results of these inspections are included under their respective headings, discussed later in this report.

Physical foundation investigation was confined to exploratory borings. Under Division 2 of the specifications the contractor (GLR) was required to drill four inch cores before excavation. The approximate locations of the exploratory drill holes are shown on the drawings. The following are the quantities and locations of the subsurface program. There are 18 borings in the Lower Approach Wall, 42 borings in the Upper Approach Wall, 94 borings in the River Wall, 87 borings in the Middle Wall, 50 borings in the Land wall, 5 borings in the Inlet Structure, 5 borings in the Outlet Structure, 7 borings in the Land Culvert, 1 borings in the Middle Culvert. The information derived from these borings was used to supplement preconstruction exploratory information. The combined information was then used to either to confirm or used to establish new founding elevations for the monolith structures.

(For locations and detailed logs of these borings see book #3.)

## SECTION III

### GEOLOGY

#### 3.01 Physiography and Topography

The Gallipolis Project area is located in the Ohio River Basin. The Ohio River Basin is part of the Kanawha Section of the Appalachian Plateau Physiographic Province. The present landscape evolved when an area of little or no relief was uplifted. The uplifted area was deeply dissected by subsequent down cutting of rejuvenated streams. The surface maybe described as an elevated, somewhat rolling plain. The rolling plain was dissected by the destructive actions of running water. This developed an intricate system of hills and valleys. The degree of the dissection and the difference in the underlying strata has resulted in a variety of topography. The topography ranges from slightly rolling plateaus intersected by narrow, steep-walled valleys to the Appalachian Plateau. The Appalachian Plateau has been dissected into a series of flat topped hills and ridges separated by narrow valleys. While the valleys have grown wider, the hills have become sharply crested. The streams now assume meandering courses across the valley floors.

The drainage patterns established by these post-uplift streams have been extensively modified by glaciation. Although the glaciers did not enter the project area, they did block the northward flow of the primary streams of the drainage basin. The drainage system in the project area today is dendritic. The Ohio River is the primary stream in the present drainage system. The present drainage system was formed when the old channel segments were connected with new segments. These segments were connected by cutting across low points in the drainage divides. The Ohio River has subsequently developed into a mature stream. The flood plain at the project site is approximately one mile wide and is flanked by hills approximately 300 feet high. Elevations in the area of the project (Mason County) range from 1070 feet above sea level to the Ohio River normal pool elevations ( 515 downstream and 538 upstream ) . The Ohio River drainage basin consists of 20,560 square miles.

### **3.02 Seismicity**

The project is located in the seismotectonic region known as the Central Stable Region. The largest known earthquake in this region since 1820 occurred in Attica, New York in 1929. The Attica event has been characterized as an VIII Modified Mercalli, but recent evaluations assigned a VII to this event.

The Gallipolis project lies in an area characterized by low seismicity. Historically, within this tectonic region, there have been four earthquakes with Modified Mercalli Intensities of VI (VI MM) and no known events greater than VI MM since 1776. The return period for a VI event at Gallipolis is in excess of 200 years and the probability of occurrence within a 50 year period is 20 percent. The return period for an VIII event at the project is more than 5000 years. The probability of occurrence in a 50 year period is 1 percent. The acceleration value for Gallipolis Locks Replacement is .05G. This was considered reasonable and unlikely to be exceeded during the life of the project.

### **3.03 Description of Overburden**

The overburden within the project area consists of deposits of alluvial sediments. The alluvial deposits consist of sediments of clay, silty clay, sandy clay, clean sand and sand with rock fragments. These sediments were partly derived from the sandstones and shales found upstream. Also found in these sediments are the remains of igneous and metamorphic rocks, referring to glacial origins. Some of the common types found were: Pink Granite, schist, quartz and pegmatitic rocks. The down cutting effect of area streams, combined with spring floods have eroded and transported these materials to place them at their present locations. Some of the smaller streams have intermixed these sediments to various degrees on the project. The average thickness of these sediments ranges from fifty to sixty feet.

### **3.04 Bedrock Stratigraphy**

The Kanawha section of the Appalachian Plateau consists of sedimentary rocks of the upper Pennsylvanian to lower Permian age. Included in this period are the formations from the Conemaugh series.

Within the project area, the combined vertical extent of this series is about 570 feet. The Conemaugh series consists of several sandstone members. Many of the sandstones contain discontinuous shale lenses. These sandstones grade from coarse grained micaceous sandstones in the Southern end of the project, to fine grain siltstones and/or shales in the north of the project. The series is 450 feet to 600 feet thick and contains the sequence of strata from the lower Pittsburgh Sandstone to the lower Mahoning Sandstone. The Conemaugh is divided into 23 mapped members, but only four, The Connelville Sandstone, The Clarksburg "Red Beds," The Morgantown Sandstone, and The Birmingham "Red Beds," are mapped at the project.

The Conemaugh, like other Pennsylvanian formations, is defined boundary wise by referencing it to coal beds. The Conemaugh contains little coal of commercial value in West Virginia. The series is sometimes referred to as the "lower barren measures." The sandstone members were possibly deposited in a broad delta and/or flood plain by streams transporting material from adjacent elevated land masses.

### **3.05 Bedrock Structures**

The Appalachian Plateau Physiographic province contains 120 anticlines and an equal number of synclines. All have been mapped and described. Many are small or minor folds and of only local significance. Many of these anticlines and synclines are in the western part of the state of West Virginia. These features readily parallel the trend of the Allegheny Mountains. There are no significant structures due to these anticlines. Strata dip is E-W and strike is N-S. The two most significant structural features at the project site are: slicken - slides in the clay and claystone and some sedimentary structures. These sediment features are normal faults. Accompanying these are broken zones or zones of intense fracturing.

### **3.06 Economic Geology**

The Conemaugh series has produced gas, oil, and coal. The coal producing beds of the Conemaugh series are: The Little Pittsburgh, The Little Clarksburg, Elk Lick, Harlem, Upper Bakerstown (Thomas), Brush Creek, and Mahoning. The Harlem, Little Pittsburgh, and Little Clarksburg have not been

mined in West Virginia. The coal beds of the Conemaugh Series are of little commercial value at this time.

The Connellsville, Morgantown, Saltsburg, Buffalo, and Mahoning sandstones have produced some oil and gas. In the state of West Virginia they are named Minshall, Murphy, Moundsville, First Cow Run, Little Dunkard, and Big Dunkard Sands respectively.

Some of the limestones are suitable for producing building stone, agricultural lime, Portland cement, and road materials. Several of the sandstones have been quarried for general building, ornamental stone and pulpstone.

### **3.07 Bedrock Weathering**

The topography of the Ohio River basin at the project site is an example of differential weathering that accompanies valley formations. As a result, the valley walls where sandstone members are exposed have slightly steeper slopes than the shale and clay members. This leads to large overhangs and over breaks of overlying members.

Bedrock in the valley floor as exposed in the monolith foundations, for the most part, exhibited a minimal extent of slight to moderate bedrock weathering. The degree of weathering, depends on the type of material exposed at the original top of the rock. The sandstones and siltstones showed slight weathering to only about three fourths of an inch in depth. The shales and claystone showed and increased weathering pattern up to a moderate scale. The depth of penetration varied from six to ten inches.

The shale and claystone were observed to deteriorate, after their exposure. The observations were made on the walls of the excavated monoliths. These members were sloughing off in small pieces in sizes ranging from one eighth of an inch to one inch. To alleviate this problem, Aerospray 70 was applied and effectively sealed off these areas to minimize the effects of weathering.

### **3.08 Leaching and Solution Activities**

Leaching and solution activities at the project are confined to calcite, and pyrite. The calcite was found in fractures and 1/8 inch to 2 inch seams. Pyrite crystals were found in small isolated pockets on the invert's of the downstream monoliths. Crystal forms of calcite and pyrite were found on the project. Crystal size was relatively small and typical for that mineral type.

The parent materials for these leached minerals are:

- A) calcite from the cementing medium in the clastic sedimentary rocks.
- B) pyrite from the small inconsistent coal seams.

These two sources are found in the rocks located in the upper elevation of the Conemaugh formation, or from the percolation of the ground water through the these porous rocks.

### **3.09 Ground Water**

The ground water level at the project was determined during preconstruction subsurface exploration and surface observations. The ground water, as measured in drill holes and in piezometers appears to approximate the Greenup pool elevation 515.0 downstream and the Gallipolis pool elevation 538.0 upstream. Near the extended centerline of the existing dam, conditions of ground water are complicated by a perched water table and the transitioning effect between the upstream and downstream river elevations. In addition, the perched water table was encountered in a portion of the required excavation. Its location was adjacent to the extended centerline of the dam. This condition was expected due to the swampy condition of the location and because of the large amount of pervious material placed over low permeable clayey soils during the construction of the original lock. Before excavation and during construction of the new locks, control of the ground water was achieved by a slurry trench and dewatering well system. Ground water levels were monitored with piezometers. This system encompasses the entire project, approximately 4000 feet long by 900 feet wide. After excavation of overburden and blast materials, staining and odors showed evidence of low iron and sulfur content in the groundwater. In several cases, the lithologic boundaries between the sandstone and shale and between the shale and claystone showed moderate

ground water seepage. This water was controlled by using a Vactor Truck and/or pumps. In various locations on the project, artesian flow were encountered during drilling and grouting operations. The artesian flow was less than 0.01 cubic feet per five minutes per hole. The aquifers for the most part were the sandstones located in the downstream area of the project.

### **3.10 Engineer Characteristics of Overburden**

Disturbed and undisturbed soil samples were tested at ORDL (Ohio River Division Laboratories). The results can be found in the design memorandums. The tests results provided the following information on the soil samples.

(1) There were four major divisions: clay, clay sand, clean sand and a sand and gravel mixture. A sufficient quantity of suitable impervious and granular materials required were present to construct the structures.

(2) The complete removal of overburden was necessary and all structures were founded on bedrock. During excavation, materials were stockpiled and used in construction of the dikes. Where the materials were placed depended on the type of material and the type of work being done at that time. Material found unsuitable for construction was wasted in the pond area of the project. The materials were tested by Consulting Testing Laboratories (CTL) during excavation and placement. The material was classified, water content checked and gradation tests performed before it was used in the construction program.

### **3.11 Engineer Characteristics of Rock**

In 1984 and 1986, representative rock samples from the six inch core borings were tested by Ohio River Division Laboratories (ORDL). The laboratories rock test data can be found in; Test Results, November 1984 and Design memorandum Volume 1 Phase II General Design Memorandum. The results of the test were used in selecting founding elevations and in designing the Lock Structures.

## SECTION IV

### EXCAVATION PROCEDURES

#### 4.01 General

The contract Specifications for the Gallipolis Locks and Canal required a specific construction sequence. The major construction sequence are as follows.

- (1). Construction of the Downstream Cofferdam with Overflow section,
- (2). Completion of the Slurry Trench Cutoff Wall and Dewatering System,
- (3). Relocation of Flatfoot Creek before construction of the primary disposal dike

#### 4.02 Downstream Cofferd Dam

The construction of the downstream coffer dam and overflow section began on 4 June 1988 and was completed on 30 June 1988. The coffer dam consists of six sheet pile cells and five sheet pile arcs. The cells and arcs are sand filled with a twelve inch concrete cap. The overflow section consist of the sluiceway, timber needles and the slush grouted splash pad. Cells three, four and five have the openings for the needles and the sluiceways. The needles and sluiceways are twenty-two feet wide. The needles are constructed of eight by twelve timbers held together by a steel W12X53 beam. There are twenty-two timbers per sluiceway. At the end of the sluiceway is a twelve inch thick by twenty-six feet wide splash pad. If the needles are removed, the splash pad serves as erosion protection for the top of the slope. The face of the slope is protected by six to eight inch stone with a slush grouted surface. The cells

are anchored to the slurry trench on the east side and the existing locks on the west side. The connection to the existing locks was made with a concrete plug. Connection of the coffer dam cell to the existing guide wall was completed on 29 August 1988.

(See Book Four, Page 13, Picture 5 for the Downstream Cofferdam)

The total amount of material used in constructing the Downstream Cofferdam was: PS 31 sheet piling 51069.0 feet, sand fill 25,241.0 cubic yards, stone 150 pounds per square yard, slush grout 4,229.6 square yards and concrete 807.0 cubic yards.

#### **4.03 Slurry Trench**

In order to excavate below the water table by conventional methods, for the new Gallipolis Locks, a slurry cutoff wall was installed. The cutoff wall was constructed around the excavation, down through the alluvial sands into rock to prevent seepage into the excavation of the construction site. Dewater wells were installed in the excavation site to pump out ground water trapped, inside the cutoff wall. Piezometers were installed to check the efficiency of the cutoff wall and the dewatering wells. The efficiency of the dewatering system was approximately 98 percent. The north east area of the project was the only area found to leak. the problem was corrected adding a sump and pumping when needed. Piezometers were located both inside and outside the slurry trench. Construction of the slurry trench began on 25 March 1988 and was completed on 3 August 1988. The tie-in of the slurry trench to the coffer dam cells was completed on 22 August 1988.

The excavation of the overburden down to rock along the alignment of the slurry trench was accomplished with a 1266 Koehring backhoe with an extended boom. The contractor used a second backhoe, a 1066 Koehring for a standby. The average depth, including rock key was 70 feet.

The production of the excavation varied due to the type of material encountered. Problems in the excavation of the slurry trench were mainly related to the equipment's hydraulic system and engines. The keying into rock was completed by a Manitowac 3900 and a Link Belt FMC-518 crane, with a

chisel. The Link Belt also used a clamshell bucket. The clamshell was used to remove sand and chiseled rock debris from the bottom of the trench.

The Bentonite was stored on site in bulk form in silos. The silos were situated over two mixers each having the capacity of three and one half cubic yard. The mixers were capable of mixing one hundred cubic yards per hour. The mix design called for a marsh viscosity of 50 to 70 seconds, a specific gravity of not less than 1.10 and a sand content of not more than 10 percent. After mixing, the bentonite slurry was placed in a 1,600 cubic yard pit to hydrate. After hydrating for twelve hours, the slurry was pumped into the trench. This was done to support the walls of the excavation.

This method of excavation was very successful in that little spalling or cavitation was observed. The newly mixed and in-place material was tested for viscosity and unit weight. The only problem was a high sand content, which was corrected with a sand removal unit.

Backfill was designed to use the material removed during trench excavation. This material was tested every 500 cubic yards for gradation. Bentonite slurry was added to the back fill material until a slump of three to six inches was reached. The slurry and backfill materials were mixed together, twenty-five feet from the trench by a Komatsu D68P Dozer. This mixture was then transported to a Pug Mill Mixer, situated near the trench by a Link Belt crane, LS-108B with clamshell. This second mixing was to blend the materials and/to add fines or bentonite as needed. The material was then placed into the trench by the Pug Mill Mixer, until it was one foot from grade. Depth soundings were taken every twenty feet on in-place material twice a day.

A covering, of a heavily woven geotextile material, was used as a filter cap. The geotextile material was fifteen feet wide and centered on the open slurry trench. In the areas of the esplanade and where roads crossed the trench, a reinforcing material was placed. This situation was only 2 percent of the total length of the slurry trench. The reinforcing material was a dry blend of bentonite, sand, half inch crushed stone and one inch crushed rock. This mix design was controlled by volume. The bentonite component made up eight percent of the total volume. The remaining ninety-two percent was made up of: one part sand, one part half inch crushed stone and two parts of one inch crushed stone. The blended material was transported to the work area by three subcontractors. After reaching the job site, transit mixers placed the material on the filter cloth over the trench. The material was leveled by hand. Upon

completion of the reinforcement, a five foot lift of impervious clay was placed over the entire slurry trench.

(Reference Book Four, Pages 3,4, pictures 5-10)

#### **4.04 Dewatering system**

The dewatering system consisted of thirty-six wells and nineteen piezometers. The wells were installed within the area of excavation. Eleven piezometers were installed inside and eight outside the cutoff wall. The dewatering wells were installed by using the Holepuncher- sanding casing method. A twenty-four inch diameter casing (hole puncher annulus) was driven and jetted to rock. The casing was flushed until clean. The eight inch SDR 26 PVC pipe was installed and the filtering medium placed around it. The submergible pump and riser pipe were installed. The electrical connections were made at a later date. The piezometers were installed using the same methods as the wells. The only exception was the diameter of the pipe which was one and one-half inches. The combination of the slurry cutoff wall and the dewatering system, worked very well at the project. In June 1990, all the wells were disconnected and/or removed, except for the three on the downstream end of the project. The removal of the wells was at the contractors request.

(For more information see Appendix Section XI, pages 11-I-1 -11-I-10.)

#### **4.05 Relocation of Flatfoot Creek**

The relocation of Flatfoot Creek was necessary due to its location on the project. Before construction began, Flatfoot Creek meandered across the flood plain on its way to the Ohio River. Its location, corresponded with the proposed primary disposal area. The creek was directed into Ditch NO.4, which was constructed to replace the old outlet channel.( see vol.1 DACW drawing 16/52 and 16/75) Excavation of Ditch NO.4 was accomplished by a EX 1000 Hitachi Backhoe. Material removal was completed by 350CTK Payhauler. The removed material was placed in a stockpile for later use. Ditch NO. 4 has a nineteen percent slope and is twenty feet wide at the bottom. The side walls are protected from erosion by filter cloth and twenty-four inch stone.

(Reference Book four pages 5 picture 12 for flatfoot creek relocation)

#### **4.06 Site Excavation**

The excavation of the general work area began on 21 November 1987 and was complete on 11 February 1989. The general work area contain the work limits for rock excavation and the upper and lower guide walls. The contractor had planned to excavate the project area in two ways.

Step one was to remove as much of the material as possible using 651 Cat Scrapers. The limiting factor in using scrapers was the moisture content of the soils. When an area of saturated soil was encountered, removal by scrapers was difficult or not possible. The contractor used Cat Dozers to push the scrapers until both became immobile. The scrapers were then relocated to another section of the excavation.

Step two was the location of backhoes into that area and excavation continued. Three types of large earth moving backhoes were used, a 1066d Koehring, 1266d Koehring and a EX1000 Hitachi.

This two stage form of excavation worked quite well and was used extensively. When excavation of the overburden reached just above the rock, the scrapers were replaced entirely by backhoes. This was due in part to the varying elevation of the rock. This material was placed in dike construction, stockpiled, or in the waste area.

(Reference Book four, page 5, picture 11 for general excavation)

## **SECTION V**

### **BLASTING**

#### **5.01 General**

The specifications required, the contractor to submit a proposed blasting plan to C.O.E. This plan contained: Types of blasting material, typical shot layout and safety regulations for state and federal as they apply. The contractor was required to submit to the contracting officer, shot plans for each blast for approval. These plans contained: loads for each hole, stemming height, firing mechanism, delay sequence for each hole, and the seismic setup for that shot.

(For an example see appendix XI, page J) (Reference book four, pages' 6-7, pictures' 15-20 for blasting)

#### **5.02 Presplit**

Presplitting is a form of controlled blasting in which charges are fired in closely spaced holes. These holes are on the perimeter or outline of the excavation. This type of blasting is done to create a vertical and inclined plane of weakness. This plane controls the energy of the production blast. At Gallipolis, presplit holes were drilled two and one-half inch and three inches in diameter. The predominate hole size was two and one-half inches. The spacing for these shots were eighteen to thirty inches' center to center. The presplit holes were drilled, in all locations to final grade. Depth of presplit holes varies due to founding elevation. The maximum presplit depth was 29 feet, minimum depth was 2 feet.

#### **5.03 Production blast**

Production blasting is a form of blasting to break the mass into pieces. These pieces are of a size to be handled by conventional equipment. The drill

spacing is 2 x 2 foot center to center pattern. The blast is designed to allow the energy to move to an open face. This is done to reduce the damage to the rock. On the project, production blasting was complicated by the sudden changes in rock lithologies and the interbedded sandstones, shales, and claystone. These lithology changes could not be fully compensated for. The method used was to place stemming material, one foot of limestone chips in the bottom of the hole. This method sometimes worked well in sandstone, but not in the claystone and shale. The final product of the blasting were foundations with shot holes, and fractures. The shot holes varied in size from twelve inches to two feet diameter. The fractures radiated from one shot, sometimes connecting to another. The length of the fractures averaged about five to ten feet.

#### **5.04 Line Drilling**

Line drilling is a method of over break control. A series of very closely spaced holes are drilled on the perimeter or on parts of the monolith outline. These holes are not loaded with explosives. The use of line drilling at Gallipolis was extensive. Line drilling was used on inside and outside corners, and in where elevations changed between monoliths. It was also used for excavations, where the sills and the walls meet. The following is a breakdown of locations, where line drilling was performed and of lined drilled surfaces formed:

- (1). Main Lock Sills 11750.0 square yards,
- (2). Auxiliary Sills 11997.1 square yards,
- (3). Land Wall Steps 2136.5 square yards,
- (4). Middle Wall Steps 1349.0 square yards,
- (5). River Wall Steps 2734.4 square yards,
- (6). Culvert Steps 1408.0 square yards,
- (7). Corners 8189.0 square yards.

The use of line drilling was of limited success. In most cases the corners and edges of monoliths broke off. This happened during excavation or shortly after. These condition could have been caused by the blast or by the method of excavation. The blast could have caused intense fracturing, thereby weakening

the rock. In several cases failure was due to a nature weakness in the rock. These weakness were natural joints and fractures or slicken sides.

The surfaces of the line drilling were of a good quality, but were damaged during excavation. The use of large excavation equipment with ripper teeth, excavating 90 degrees to the foundation should not be allowed. If the equipment excavates parallel to the structure and does not pull material into the wall, further chances of damage to the line drilled face and foundation are reduced.

(Reference volume four pages 74-77 for pictures of over breaks)

(Reference Exhibit #10 for locations of line drilling page 14-I-1)

#### **5.05 Statistic**

Upon completion of the blasting, the total explosives used was 407,295 pounds. The powder factor was 1.20 pounds per cubic yard of rock. The material used was:

	<u>Primades</u>
321 cases of 2 x 8 unigel	#5 5900
2160 cases of 2 x 16 unigel	#6 5900
310 cases of presplit 7/8 x 24	#7 5300
122,000 feet of e-cord	#8 5300
#209 primer 200	
3570 spacers	
115,000 feet Noel lead line	
5250 #17 caps ,1235 #100 caps	

(For more information see appendix XI page J)

## SECTION IV

### ROCK EXCAVATION

#### **6.01 General**

The specifications reference rock excavation as: excavation that in the opinion of the contracting officer that requires continuous systematic blasting, ripping, or wedging of material. This includes loose boulders and rocks one cubic yard or larger. It also includes soft rock and earthen materials encountered below top of rock. At Gallipolis, there were three types of excavation in actual use:

- 1). General Rock Excavation,
- 2). Buffer Zone Excavation,
- 3). Sill Excavation.

#### **6.02 General Rock Excavation**

General rock excavation involved all areas, except the Buffer Zone and Sill Excavation. this type of excavation involved the removal of the bulk of the rock to reach final grade. There were several steps involved in this operation and more than one type of excavation. General rock excavation involved two main steps:

- 1). Excavation of the overburden to the top of rock and presplit the monolith outlines.

- 2). The production holes inside the presplit lines were drilled and shot. The shot material was excavated to produce an open face or relief zone. The final step was repeated usually two to three times. The specification required blasting of two-thirds of the final depth to reach monolith's final grade.

Equipment used to remove the shot material was 1266 Koehring backhoe, Hitachi EX1000 backhoe, Case 9170 tractor and Catapiller D8 dozer. Material was hauled to the waste area by 350CTK Payhaulers.

(Reference Book four, page 7, pictures 21,22 for rock excavation)

### **6.03 Buffer Zone Excavation**

The Buffer zone was used in critical areas to lessen the blast impact. The buffer zone excavation was in the following areas: Critical areas: culvert turns, areas around the sills, and Inlet structures and R-78 to R-95.

The contractor did not use any specialized equipment in this phase of excavation.

Buffer zone excavation worked very well around the sills, but in turns or corners it was of limited success. The use of this type of excavation is a asset and should continue to be used.

#### **Procedure**

The buffer zone excavation was performed as follows:

- 1). General rock excavation material was broken by production blasting, and excavated to provide relief for the buffer zone excavation.
- 2). The Buffer zone material was drilled and loaded with a light shot that was directed into the relief zone provided by the previous excavation. The excavated material was hauled to the waste area. The Buffer zone excavation was performed to protect the

Integrity of foundations, where several required blasting intersected each other.

Buffer zone excavation did not achieve the best results, due to intrusion of shale and claystone lens. Under different lithological conditions, buffer zone excavation would be more successful. Buffer zone excavation should continue to be used in areas, where several walls and blasts intercepted.

(Reference Exhibits Drawing #11 page 14-J-1)

#### **6.04 Sill Excavation**

Sill excavation included all the following areas: Bulkhead Sills, Miter Gate Sills, and Emergency Gate Sills. The procedural difference in Sill excavation was produced by the blasting. In blasting the sills, every other hole was loaded. The loads were reduced to prevent the rock from over breaking. The blast results were larger pieces of material. These larger pieces had to be reduced in size by mechanical means. The contractor did not use any specialized equipment to do Sill Excavation. The equipment used was the same as in General Rock Excavation.

The results of sill excavation depended on rock type and quality. Sill excavation worked well in the downstream sills due to the quality of the sandstone. However, the upstream sills were founded on and cut through shale and claystone, and here sill excavation did not work as well. Instead of every other hole, every third hole should have been loaded.

Attention to rock types, hardness, and overall condition of the material is essential in achieving good results from blasting.

### **6.05 Statistic**

Upon completion of rock excavation, the totals were: General Rock Excavation 299,209.0 cubic yards, Buffer Zone Excavation 38,564.8 cubic yards, Sill Excavation 19909.4 cubic yards. The total rock removed was 357,683.2 cubic yards.

### **6.06 Aerospray 70 Binder**

The specifications required a protective coating to be applied within twelve hours after monolith excavation. The protective coating was applied to designated vertical and horizontal surfaces. The binder was to be applied in two coats with 46% to 48% solids.

Aerospray 70 is a polymeric soil stabilizer. The stabilizer function was to reduce or eliminate surface erosion. The polymeric binder was used to stabilize exposed claystone, clay and indurated clay in the presplit side walls of the monoliths. Aerospray 70 was applied using a airless paint unit.

On one occasion, the binder was applied to the invert of Monolith L-3. Due to the low absorption of the clay, the binder laid on the surface until drying. The invert became very slick due to the application of Aerospray 70. The slick surface created a safety problem and no protective benefits were observed. No further application of Aerospray 70 on other invert was attempted. There were two correctives measures employed on problem foundation:

- 1) Reduce the time between foundation preparation and placement.  
This reduces the time the foundation is open to the elements.
- 2) Keep the foundation from going threw the wet/dry cycle. This keeps the foundation at a constant moisture content, and does not allow it to spall or peel.

Using these measures reduced the destructive consequences of the elements on a foundation.

The binder was applied as soon as time and the elements allowed. It was mixed 50% binder to 50% water. This ratio was as thick as could be sprayed with the contractor's equipment. Upon completion of the project 1,876.5 gallons of Aerospray 70 had been applied.

The use of Aerospray 70 worked well in stopping surface weathering. But on one occasion, at monolith R-47 water built up behind the binder until the rock failed. The slide area stripped of all loose rock and replaced with, approximately 45 cubic yard of concrete. Reference volume 4, picture 252. The use of this product should continue to be applied in all excavations, which involves clay and shale materials

(See appendix book 4, page 8, picture 25, for binder application)

## SECTION VII

### FOUNDATION ROCK ANCHORS

#### 7.01 Anchor Bars

Anchor bars in rock were required for the Miter Gate Sills in both chambers, upstream and downstream. The rock anchors were constructed by:

- 1). Drilling a one and five eights inch hole,
- 2). Placing a grout Jacking pad around the hole,
- 3). Using a twenty foot plastic pipe and high pressure air to clean the holes,
- 4). Inserting Fastloc T Resin cartridges, X number of fast set and Y number of slow set,
- 5). The number ten anchor rods were inserted using the drill. The anchor rod was rotated while advancing through the resin cartridges.
- 6). The resin required a certain period of time for sitting. Upon completion of the set time, the bearing plate was positioned on the grout pad. The retainer nut was then placed on the rod and tighten until snug,
- 7). The Jack ( a Enerpac model LH-2506) was positioned and the rod tensioned to thirty-three kips. The retainer nut was then tightened.

(Reference Book four, pages' 61-62, pictures' 207-212 for Rock Anchors)

## **7.02 Completion Phases**

The Rock anchors were completed in two phases. The first Phase was the downstream sills. The second phase was the upstream sills.

### **Phase I**

15-19 March 1990, Fifty-five anchor bars were set in the downstream Main Lock Miter Gate Sill. An average of five fast set and seventeen slow set fastloc cartridges were used per hole.

20-22 March 1990, Fifty-five anchor bars were set in the Auxiliary Miter Gate Sill. Five to six fast set and sixteen to seventeen slow set cartridges were used per hole.

### **Phase II**

17-20 May 1991, Fifty-six anchors were set in the upstream Main Lock Miter Gate Sill. An average of six fast set and sixteen slow set cartridges were placed in the holes. One rock anchor was replaced due to the contractors welding and cutting on the metal rod. This caused the tensioning sequence to be out for this sill.

20-23 June 1991, Fifty-five anchors were set in the Upstream Auxiliary Miter Gate Sill. Five to six fast set and fifteen to seventeen slow set cartridges were used.

The anchor and resin system functioned as required. The artesian flow did not create a problem, during anchor installation.

### **7.03 Statistics**

The total drill footage was 5,720 linear feet. Each Sill's footage was 1,430 lineal feet or one fourth of the total. Two hundred and twenty anchor rods were set for a total length of 5,500 linear feet. There was 1201 fast set and 3639 slow set cartridges used. The average number of cartridges, installed per hole was 22.

## SECTION VIII

### CHARACTER of the FOUNDATION

#### 8.01 Foundation Surface

The foundations excavated at Gallipolis varied in depth from 2 feet to 28 feet as measured from a average top of rock. The final elevations were chosen using cores taken from each monolith. The final foundation surfaces for the various components of Gallipolis Lock Replacement Project were controlled by the bedding structures in the shale and claystone members of the Conemaugh Formation or by shale lens or seams in the sandstone.

The foundation surfaces consisted of thin to massive coarse-grained micaceous sandstones in the downstream area grading to claystone and shales in the upstream area. Discontinuous shale lens and seams were found in the sandstone lithologies. The seams and lens varied in thickness from a half a foot to two feet. These lens and seam were encountered in the west vertical wall of the River Wall and in the foundation inverts. The shales had clay and calcite seams varying in thickness from 0.25 to 3 inches. Calcite was found in seams from .5 to 3 inches. These were located in the inverts of many foundations in the upstream monoliths. The seams of clay and calcite were removed and repaired using dental concrete.

The foundation for the River Inlet Structure was founded on shale. This structure was presplit and excavated by a 1266 Koehring backhoe. No production blasting was performed. The shale was soft to very soft in hardness and was in thin bedding planes. When excavated these bedding plans were easily broken. The foundation surfaces remained good, if after exposure it was sealed with concrete within 24 to 48 hours. When this did not happen, large areas had to be reworked to remove lose material and dental concrete used to repair them.

## **8.02 Condition of Foundation Rock**

The condition of the foundation rock for the lock structures ranged from poor to good. The physical properties of the foundation sandstone, siltstone, and shales were well suited for founding surfaces. Claystone and weak shales were not intended for foundations. Some seams and lens were left in place and sealed off with dental concrete. These areas were left, due to the closeness of the indurated clay.

The primary problem concerning the foundation rock was the bedding planes and the softness of the clays and shales. In their natural state each rock type causes problems in blasting and excavation to grade. These problems included rock overbreak and damage to the foundation invert surface. This was caused by the brittleness of the material and the bedding planes. However, these problems were sometimes anticipated from information derived from exploratory borings. If anticipated, blast plans were modified by reducing loads or spreading out the hole pattern.

The most detrimental factors concerning the foundation rock were the numerous clay seams and broken zones. Most of these were contained in the upstream shales and claystones. Although these structures were treated, by the use of dental concrete, they could still represent an inherent weakness in competent foundation rock.

(Reference Dental Concrete Appendix Section XI, page F)

(Reference Book four, pages' 64-74, pictures' 214-248, for dental repairs)

## **8.03 Water**

Ground water caused various degrees of deterioration in the clays and shales. The most notable was the contact between the claystones and/or indurated clays and shales. The deterioration ranged from minor to severe in the shale and clays. A example of this deterioration is in the upstream sills and some of the Land Culverts. In these areas, the rock was excavated and back filled with a granular material. the specification call this protective earth cover. Months later, after excavation of the granular, the rock was in poor condition. This was evident by the open bedding plans, broken corners and overall

decrease in hardness at the surface due to weathering The problem areas were isolated and sealed off by dental concrete.

#### **8.04 Foundation Cleanup and Preparation**

The specifications describe foundations as the rock surfaces upon which concrete structures are placed. The preparation and cleanup of these areas was accomplished by light Equipment and hand tools in combination with high pressure air and water.

The use of rubber tire equipment on cleanup was extensive. The contractor used a Case 9170 Tractor to remove the remaining debris from the foundation. The air/water combination was used to wash and remove dirt and small rocks from the invert. The hand tools included: chipping guns, small jackhammers, spud bars, and shovels. The hand tools were used to remove drummy rock. The following was the sequence of events in foundation cleanup and preparation.

- 1). The case tractor removes debris left by the excavation of the monolith.
- 2). The fine material is blown or washed off by the combination of air/water.
- 3). The Project Geologist sounds the foundation for drummy rock. The bad rock was marked for removal with orange paint.
- 4). The cleanup crew removes the drummy material by chipping guns, pry bars shovels and other hand tools. Then the foundation is washed with high pressure air and water.
- 5). The geologist inspects the foundation again for drummy rock. At this point, he will either approve or remark the foundation again. If the foundation was remarked, the sequence starts at step 4. These event were repeated until the foundation was approved

(Reference Book Four, page 8, pictures 23,24)

## SECTION XI

### FOUNDATION TREATMENT

#### 9.01 General

The foundation treatment for Gallipolis Locks consisted of the following.

- 1). Installing a grout curtain under each of the three walls.
- 2). Drilling weep holes in the Main Chamber and Auxiliary Chamber Lock floor pavement areas and the Auxiliary Chamber Lock Laterals.
- 3). The final rock surface treatment on the foundations was dental concrete. Dental concrete was used to repair depressions, broken zones, exposed clay seams and open joints.

#### 9.02 Curtain Grouting

A grout curtain was placed beneath each of the three walls to reduce leakage through the rock under the locks. This curtain was constructed in two zones. Zone one was from founding elevation to elevation 470. Zone two was from elevation 470 to elevation 460. These curtains extend from 13+75B to 1+25A. The location of each line is as follows: River wall 78.05 feet from construction base line B; Middle wall 76.05 feet from base line B; Land wall 230 feet 1.5 inches from base line B.

(See exhibits II, page 14-K-1 for more information)

The grout curtain was developed by drilling thru preformed holes inside the walls. Metal pipe was embedded in concrete from founding elevation to the culvert invert and to the top of some monoliths. Therefore, drilling of the 1 7/8 inch holes began at founding elevation for each monolith within the limits of the grout curtain. Founding elevations for the various monolith foundations vary

throughout the project. The spacing of the holes along the grout line was 20 feet between primaries with two tertiary and one secondary hole between. Hole spacing was five feet and all holes were drilled vertical. Drilling of these holes was done in zones and sections. Zone one consisted of fifteen feet or less of rock and zone two consisted of ten feet of rock. All grout holes extend into zone II. The sections, for drilling and grouting were 200 feet in length. The drilling and grouting operations were not permitted at the same time in the same section.

As a rule, all primary holes in a zone were drilled and grouted before secondary holes were drilled. This drilling began on the next zone. As a general rule, if a hole took over 100 bags of cement in a zone, split space holes were required on both sides of that hole. The following procedure was used for the grouting program.

- 1). Pressure tests and grouting pressures were regulated so that the occurred pressures would not exceed burden pressures. Burden pressure was calculated using 1 pound per square inch for each foot of rock and 1/4 pound per square inch for every foot of embedded pipe. Pressure was measured at the top of the grout hole.
- 2). Pressure grouting of a hole was required when during a 5 minute pressure test, water injected exceeded the average of 0.2 cubic feet per minute.
- 3). Pressure grouting for a particular zone was considered sufficient when grout injected either reached refusal or the hole refused to take grout at 3/4 of the grouting pressure.

To expedite the grouting program, the work was performed in three phases.

Phase one was between 23 March 1990 to 20 June 1990. This first phase consisted of grouting of the downstream downstream sills, 813 feet of the River Wall and 403 feet of the Middle Wall.

Phase II was between 8 January 1991 to 15 March 1991. It consisted of 638.5 feet of the River Wall, 1048.5 feet of the Middle Wall, and 852.5 feet of the Land Wall.

Phase III began on 14 August 1991 and ended on 27 October 1991 and consisted of the grouting of the upstream sills, Miter Gates and Emergency Gate sills.

### **9.03 Drilling Procedure**

Drilling the 1-7/8 inch diameter began after the monolith had reached the final grade for the invert of the culvert. Drilling of these holes was accomplished by means of Semico, Longear, Ackor, and Diamac Drills. Phase I drilling was completed by a Semico, Long Year Drill. The Semico drill was a pneumatically powered diesel driven drill. The Long Year was skid-mounted, pneumatically powered diesel driven. Phase II and III drilling were completed by a Diamac and a Ackor Drills. Both drills were electric, pneumatically powered and were skid mounted. Movement of the drills was accomplished by forklift.

Bits used during the drilling varied with the material. In areas where sandstone, siltstone, and shale were found, an AW sized stratapack (three finger bit) was used. In the softer shale and claystone, a AW Roller Cone bit was used. Several other bits were tried, such as a Geopack bit, a Stratpack Button bit, and a Three Wing Carbide Drag bit. None of these bits were as successful as the Stratapack (three finger bit) or the Roller Cone. Every hole was tested for foreign materials with an AX size magnet before drilling began.

The only problem during the drilling and grouting operations, was the introduction of wood, steel, and other foreign material into the preformed holes.

### **9.04 Washing Holes**

Upon completion of the drilling, each hole was cleaned of drill cuttings and muck. A three-quarter inch diameter black plastic pipe was inserted into the drill hole until the bottom was reached. High pressure water was injected into the hole. The water injection was continued until the water return was clear. When this condition occurred and persisted, the pipe was moved up and down about two feet in height. This was to assure the removal of all foreign material.

### **9.05 Water Test**

The water test consisted of the following steps.

- 1). Inserting a two inch mechanical packer into the grout hole. The packer was seated at a depth of one foot.
- 2). Attaching a two inch water line with cubic foot meter.
- 3). Use the overburden method to Calculate the pressure to be used.
- 4). Start introducing water into the hole. Continue introducing water until pressure equals the calculated.
- 5). At that point begin the five minute test. During this process, holes on either side are checked for connections. If there are connections, Packers are placed in that hole and left open. These holes are retested with the valves closed and the two readings are compared. If the test results are greater than 0.2 cubic feet per minute the hole is groutable. If the results are less than 0.2 cubic feet per minute, the hole is considered a tight hole, and the test is over.

### **9.06 Grouting**

The location of the grout plant coincided with the section being grouted. The plant was on wheels and was moved to each succeeding section. This was accomplished by a crane or forklift. The grout holes were located in a single line, in the tunnels of each wall. Grouting began with the primary holes zone one and ended with the secondary holes zone two. The grout mixes were based on the preceding water test. The starting mix was standardized to prevent problems. The standardized mix was four cubic feet of water to .94 cwt of type two cement. If the injection rate, of the grout did not decrease after 14.1 cwt to 18.8 cwt, the mix was thickened. The mixes were thickened by the removal of half a cubic foot of water. This procedure continued until refusal or the 94 cwt limit was reached. During grouting operations, the rate of injection was continuously monitored and the water-cement ratio correspondingly adjusted as needed.

The grout mixes consisted of:

(1) water: The requirements for a mixing agent per the specification were: water that was fresh, clean and free of injurious amounts of sewage, oil, acid, alkali, salts or organic matter. The contractor submitted samples of water from the Ohio River and the dewatering system that surrounds the project. The Ohio River sample was turned down as a mixing agent due to the high content of chemicals, organic and iron. The dewatering system provided water that contained no adverse elements and was approved as the mixing agent.

(2) Cement: The specifications on cement called for a Portland cement, that would conform to ASTM C 150-85A, type one or two. It was to be stored in a dry, weathertight and properly vented area. The cement was provided by Armstrong Cement Manufacture Company. Armstrong was a federal inspected and approved source of cement. The cement used in grouting was a low alkali type two. The cement was furnished in ninety-four pound bags and was shipped to the project in lots of five hundred and fifty bags. At the project, the cement was stored in a metal building two hundred yards south of the Resident Engineer's Office. One hundred and twenty bags or three pallets were placed in the culvert, near the grout plant. The palletized cement was protected from moisture by plastic shrink rap. At the end of the shift, unused cement in open pallets was covered with plastic. The cement was placed through a #8 screen to remove any large pieces. This procedure was followed so that grout mix was homogenous.

#### **9.07 Statistic**

To place the grout curtain at Gallipolis, statistically 2153.26 hundred weight of solids was placed in 10,832.5 lineal feet of drilling. This averages out to 0.199 hundred weight of solids per foot of drilling. This average was below the .2 cwt/ft. estimated in the contract. The sandstone lithologies took more grout than the shale and claystone. The land wall section took more grout than the other areas. There were no unusual problems encountered during the three phases of grouting.

(Reference appendix section XII, pages 12-N-1 to 12-P-14 for more information on grouting.)

### 9.08 Weep Holes

A weep hole is a relief hole drilled into rock or overburden. After the hole is drilled, it is lined with perforated pipe, or backfilled with pea gravel. This design relieves the build up of hydrostatic pressure from below the structure. This is done to prevent the structure from moving or floating. The locations of the weep holes at Gallipolis are the Lock Floor Pavement areas and in the Lock Laterals. The specifications state that the holes will be three inches in diameter and ten feet into rock. All weep holes will be thoroughly cleaned using air and water. They will be kept clean and plugged until the contracting officer directs the removal of the plugs. The contract for Gallipolis, did not call for the pea gravel backfill. The contract was modified to correct this problem. The weep holes were installed in accordance with the specifications.

(For more information see section XIV, 14-L-1, 14-M-1, 14-n-1)

#### Auxiliary Chamber

The auxiliary Chamber contains two areas of weep holes:

- 1). The upstream Lock Floor Pavement area is located between the upstream Miter Gate and the Bulkhead Sill. It is an area of 638 square yards and contains 154 weep holes.
- 2). The Lock Laterals are located from station line 7+66.0B to 4+90.0b. There are twelve lines with forty holes per line for a total of 480 holes.

#### Main Chamber

The Main Chamber contains only one area of weep holes, the Lock Floor Pavement. The Lock Floor is an area of 462 square yards and contains 118 weep holes.

All holes were drilled using a Acker drill. There were only two problems connected with the weep holes. The contractor laid out a section wrong. The second problem was the specifications did not require, the weep holes to be

backfilled with a filter material. The contractor repaired the layout problem, by backfilling two holes with concrete. The contractor redrilling four new ones to correct the problem. The contract was modified to include the addition of a filter material, which was pea gravel. After the completion of the backfilling operations 67% of the weep holes were making water.

(For drilling information see Appendix Section XI, page L)

(For layouts and Numbering system see Exhibits, Section XIV pages #13, #14, #15)

## SECTION X

### POSSIBLE PROBLEM AREAS

#### 10.1 River Wall Intake structure

The foundations for the Intake Structure are made up of shale and shale interbedded with clay. These two rock types, in this area are very soft and decay quickly. The exposure to the turbulence at the Intake Structure could cause a serious erosion problem. This should also include the River Wall culverts of the intake structure. All these structures are exposed to the river by their axis.

#### 10.02 Removal of the Concrete Bolsters, Main Chamber

The concrete Crane Bolsters were removed by explosives on 10 December 1991. The removal was after, the completion of the three phases of grouting. The prime contractor used a professional blasting company, called VIBRA-TECH Engineers. The powder factor used was less than one pound per cubic yard of material. The VIBRA-TECH EVERLERT II seismograph equipment was used on each shot and a recording made. The worst reading that was recorded was shot #5. The results are as follows: air cal 137 db, tran. cal 1.02 inch per second, vertical cal 1.02 inches per second, long cal 1.04 inches per second. The recordings reflect little if any of the blast energy or vibration was directed to the foundation.

The use of explosives could have reopened joints and fractures, that were repaired during the grouting. Another concern, is the blast could have cause micro-fractures in the foundations. In both cases, the functioning of the locks could increase the problem. This is due to the raising and lowering of the pool

inside the chamber. At this time there is no way of checking to see if there really exist a problem of this type or of monitoring it. The piezometers that were to be placed in the backfill, behind the River and Land Walls were deleted.

#### Preventive measures

The protection of the intake structure could be done by placing riprap on the upstream side. This would reduce the erosional effects of the rushing water. The piezometers should be installed to verify if there could exist a problem in the foundation due to the blast removal of the crane bolsters.

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## Appendix 2

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## Gallipolis Locks Replacement

11-A-1

# Subcontracter and Area of Work

Name:	Area of Work
Griffin Dewater Corp.	Construct Dewater/Predrainage System
Philip Roberts Inc.	On site Surveying
Solar testing Lab.	Install Pizzometers
ICOS Corp.of America	Construct Slurry trench Cut/off Wall
Henderson Engineering	Geotechnical Engineer Services
W.G.Jaques Company Hayward Baker	Core Drilling/Grouting/Weep Holes
Captal City Septic Service	Pump & transport Slurry
Cadle Sanitary Service	Pump & Transport Slurry
C.H.Heist Corp.	Pump & Transport Slurry

## Government Personnel

### *Resident Engineer's Office*

Resident Engineer	Ronald C. Harris Des R. Goyal
Asst. Resident Engineer	Gordon F. Loudin
Quality Assurance	Steve P. Morgan
Contract Administration	Dennis E. Huges
Office Engineer	Charles E. Daily
Modifications/Drawings	Pamela L. Lamblin
Material Technician	Wayman G. Kisner Terrence L. Gallion Rodney C. Young
Geologist	Larry M. Drown Warren D. Nugen Michael C. Nield
Supervisory Const. Inspectors	William A. Cashion Dale E. Smith Gerald L. Warner Jr.
Military Assistant	CPT. Bill Bredessen CPT. Duncan Cook CPT. R. Richardson
Construction Clerk	Cynthia D. Huges
Construction Inspectors	Glenn R. Adkinson Michael E. Lawrence Larry A. Stalnaker Howard L. Yeager Jeanette E. Thacker Rick Pendington Jason Merritt Kenneth Snyder John E. Edwards John Glenn

## Contractors Equipment

- |                           |                          |
|---------------------------|--------------------------|
| 6 - Allmand Maxi Lite     | 3 - Allmand LT-plant     |
| 1 - Oan 12Kw Gen. Set     | 1 - Cat 175Kw Gen. Set   |
| 1 - Cat D8N 8su Dozer     | 3 - Cat 8s dozers        |
| 1 - 966c 3.5yd. Bucket    | 1 - Cat 9c Dozer         |
| 1 - Tsm 36" 245 Bucket    | 1 - Bald 966 72" Forks   |
| 1 - D9G Rear Push BK.     | 2 - Bald Rear Push BK.   |
| 2 - Bald Dien 10c Do2     | 1 - Cat 9s Dozer         |
| 1 - Gr Trash Pump         | 2 - Flygt. 6" Pump       |
| 2 - Flygt 10" Pump        | 1 - Flygt Submerse Pump  |
| 3 - Ftgt 4" sub Pump      | 3 - Cat D8N Tractors     |
| 1 - Case 1150e Tracto     | 1 - Cat D6H LGP Tract    |
| 1 - Case D6D LGP Tract    | 1 - Cat D9H Tractor      |
| 2 - Cat Dion Tractor      | 1 - Cat 988b Loader      |
| 1 - 966c Loader & Forks   | 1 - Case 580k Backhoe    |
| 1 - Case 9170 Tractor     | 2 - 619 Conc Carriers    |
| 1 - 621 Conc Carrier      | 2 - Cat 627e PP Scrapers |
| 2 - 627b PP Scrapers      | 1 - Pay Hauler Water     |
| 10 - Cat 651b Scrapers    | 1 - Washington Whirley   |
| 1 - RT58 Grove Crane      | 1 - RT63s Grove crane    |
| 1 - Cat 245 Backhoe       | 1 - Koehring 1266d B/Hoe |
| 1 - Hitachi Ex1000 B/Hoe  | 1 - Cat 146 Grader       |
| 2 - Cat 16g Graders       | 1 - Southwest Roller     |
| 2 - I-Rsp 60dd Roller     | 1 - Ram Max P33 Roller   |
| 1 - 825 Caron Roller      | 3 - Roman Disk           |
| 2 - Miller 350a           | 1 - sullair 185 DRQ      |
| 2 - 6D 150 Electri        | 1 - Champion 20HP COM    |
| 8 - Payhauler 350ctk      | 7 - Ford F-150           |
| 1 - Ford Cargo Van        | 1 - Dodge W150 4*4       |
| 1 - Ford E 150 Cargo      | 1 - Ford Bronco Wgn      |
| 1 - Ford F150 4*4         | 1 - Ford F250 4*4        |
| 1 - Ford Bronco II        | 8 - Ford F-250           |
| 1 - Ford F350 8'FDR       | 1 - Mobile 24*50 trailer |
| 3 - Tech Space 12*54      | 1 - Trailmoble Van       |
| 1 - Markline 12*60        | 2 - Strict Van           |
| 1 - Container 8*40 Flat   | 1 - Trail Lube Van       |
| 1 - Trailer Moble 44'Flat | 1 - Lts 900 Lub Truck    |
| 1 - F600 Service Truck    | 1 - Chev Ambulance       |
| 4 - Ford CR VIC LX        | 1 - LTs 8000 Dump Truck  |
| 1 - LTS Water Truck       | 1 - Ice Pile Hammer      |
| 1 - Wild Total Station    | 1 - K&E Level            |
| 1 - Wild Theod T-16       | 1 - Spectra 955 Laser    |
| 1 - MCG Innes Grapple     | 1 - Holland Road Level   |
| 1 - Density Guage         | 2 - clean Energy Furn.   |
| 1 - 40*60 Porta Shop      | 1 - Kent Demo Hammer     |

1 - Alumacraft W/8hp  
1 - Motorola Base  
15 - MOT 4 Freq MOB

10 - MOT MT500 4 Freq  
1 - Motorola Remote  
5 - Motorola MBL 100W

# Contract Quantities

Comparison of Actual VS. Estimated Bid Quantities

Bid Item	Description	Estimated Quantity	Actual Quantity	Unit	Unit Price
9	Control Ground Water & Surface Water	Job	Job	Job	3,500,000
10	Slurry Trench Cut-off Wall	545,000	499,499.0	SQ FT	12.00
11	Excavation Common	13,946,000	14,333,604.3	CU YD	2.25
12	Excavation Rock	270,000	290,701.0	CU YD	10.00
13	Excavation Buffer Zone	50,500	49,599.0	CU YD	13.00
14	Excavation Sill	20,000	19,77.0	CU YD	20.00
15	Line Drilling	31,600	39,641.0	SQ FT	10.00
16	Preliminary Clean Up	78,000	90,686.3	SQ YD	11.00
17	Foundation Clean up & Prepration	71,000	54,012.2	SQ YD	13.00
18	Dental Treatment				
A)	First 100	100	100	CU YD	700.00
B)	Over 100	200	167	CU YD	700.00
19	Protective Coating/Shale & Indurated Clay Surfaces	2,350	1876.5	GAL	40.00
20	Protective earth covering	22,500	34,641	SQ YD	8.00

Bid Item	Description	Estimated Quantity	Actual Quantity	Unit	Unit Price
31	Exploratory Drilling				
A)	Core Drilling Mobilization/ Demobilization	3 Each	1 Each	Each	35,000
B)	Core Drill 4"	12,000	11,589.76	LIN FT	36,000
C)	Pressure Test	1000.0	900.0	Each	70.00
D)	Seal Holes	1200.0	11634.96	LIN FT	5.00
E)	Protection of Samples	1 Job	1 Job	Sum	30,000
32	Foundation				
A)	Mobilization & Demobilization	1 Job	1 Job	Sum	35,000.
B)	Drilling Grout Holes	13,000	10,832.5	LIN FT	9.00
C)	Portland Cement in Grout	2,800	2,153.26	CWT	10.00
D)	Placing Grout	300	262.69	Hours	380.00
E)	Pressure test	300	123.29	Hours	312.00
F)	Steel Pipe & Fittings	9,900	15,382.0	LIN FT	8.00
65	Anchor Bar Prestressed	5,500	5,500	LIN FT	12.00
170	Concrete Slush Grouting	4,240	4,268.9	SQ YD	12.00
174	Weep Holes	7,550	7,530	LIN FT	4.00

# Contract Modification Quantities

Mod		Actual	Unit	
Number	Description	Quantity	Quantity	Price
P00007-1	Sheet Pile Sub	Job	Job	(2,835.0)
P00009-1	Disinfect Drainage wells	Job	Job	2,700.0
P00013-1	Seven Additional Piezometers	Job	Job	28,297.0
P00032-1	Revised Slurry Trench Cap	Job	Job	(57,777.78)
P00096-1	Core Drilling	Job	Job	27,250.0
P00098-1	Drilling Dewatering wells	Job	Job	26,500.0
P00137-1	Rock Overbreak	Job	Job	300,000.0
P00153-1	Common Excavation	24000 Cy.	23503.3 CY.	70,744.93
P00177	Buffer Zone Removal Credit	Job	Job	(601,000.0)
A00031-1	Credit for Predrainage	Job	Job	(8000.00)
A00059-1	Deleted Piezometers	Job	Job	(16,050.0)
A00081-1	Fill weep Holes W/ Pea gravel	Job	Job	17,958.7
A00144-1	Chamber Crossing Grouting	Job	Job	55,000.0

Gallipolis Lock and Dam

Dental Concrete

NO	DATE	LOCATION	AMOUNT OF CONCRETE	REMARKS
1	09/29/89	MONO R-38	3.00	IRR.STEP-DOWN BETWEEN R-38/39
2	01/19/90	MONO R-46	2.00	REPAIR AFTER REMOVAL OF WOOD
3	08/31/89	MONO R-47	42.00	FACE-UP THREE BDDS.PNS.& FILL TWO CAVITIES
4	08/17/89	MONO R-48	8.00	FACE BDD.PLN.& TO FILL A TRENCH AREA
5	09/28/89	MONO R-51	8.00	CHANNEL CAUSED BY OP.JT THRU BDD. PLN.
6	04/05/90	MONO R-76 & 77	8.00	TREAT BKN. ZONE
7	04/16/90	MONO R-82 & 83	13.00	TREAT A CHANNEL CAUSED BY CLAY SEAM : CONTINUES ACROSS M-84
8	04/18/90	MONO R-84	3.00	SAME AS 82,83; TREAT A CHANNEL CAUSED BY CLAY SEAM
9	11/10/89	MONO M-7	4.00	TREAT MONOLITH JOINT
10	09/19/89	MONO M-22	8.00	FACE TWO BDD. PLNS. & CONTACT BTN. M-22 & M-23
11	03/08/90	MONO M-26	8.00	FILL & FACE UP BKN. ZONE IN INVERT
12	02/09/90	MONO M-28	5.00	TREAT O.JT.IN INVERT & BDD.PLN.TIE-IN
13	02/16/90	MONO M-30	4.00	TREAT AREA CAUSED BY BDD.PLN. BREAKOUT
14	01/31/90	MONO M-31	3.00	TREAT BDD.PLN. : SLIP FAULT CONTACT
15	02/01/90	MONO M-37	2.00	TREAT BREAKOUT IN BDD.PLN. STEP
16	01/15/90	MONO L-11	11.00	TREAT BROKEN AREA CUSED BY CLAY SEAMS
17	05/01/90	MONO L-12	16.00	TREAT BROKEN AREA CUSED BY CLAY SEAMS
18	09/06/89	MONO L-13	16.00	PROTECT CLAY SEAMS , FACE UP BDD. PLNS.
19	02/15/90	MONO L-14	4.00	TREAT BDD.PLN. STEP ,FILL O.JT. IN INVERT
20	02/08/90	MONO L-16	1.00	DRY PACK O.JT. AND UNDERCUT AREAS
21	11/14/89	MONO L-22	4.00	TREAT BKN. ZONE IN INVERT
22	01/18/90	MONO L-23	3.00	TREAT NE./SW. CHANNEL CAUSED BY CLAY SEAM SLK.
23	06/15/90	MONO LC-33	4.00	TREAT SETTLEMENT FAULT IN INVERT
24	09/05/90	MONO LC-38	2.00	TREAT SETTLEMENT FAULT IN INVERT AND 2" CLAY SEAM
25	05/01/91	MONO LC-46	4.00	TREAT A 3" TO 5" CLAY SEAM DIP 35 DEG NE/SW
26	06/26/90	R,M,L, OUTLETS	12.00	TREAT DIP BDD.PLN. W/ CLAY SEAM B-W WHOLE STRUCTURE
27	04/12/91	MONO U/S EGS-1	5.00	REPAIR FRACTURE ZONE IN INVERT OF KEYWAY
29	06/13/91	MONO U/S MG-12	8.00	TREAT SLK W/ 8" CLAY SEAM DIP 32 DEG. NE-SW
30	06/18/91	MONO U/S EGS-4	4.00	TREAT A SLK W/2" CLAY SEAM IN BKN.BDD.PLN.
31	06/28/91	U/S BKS-10/11	4.00	TREAT A SLK W/1-2" CLAY SEAM IN BKN.BDD.PLN.
32	07/19/91	BAFFEL AREA A&B:	3.00	SEAL A CLAY SEAM 18-24"THICK,APPROX 3-4'DEEP,45 DEG NW-SE DIP:
33	07/22/91	BAFFEL AREA A&B:	10.00	APPROVED BY RON HARRIS AND PAT MORGAN.
34	8/26/91	LC-52/53	10.00	REPAIR A BROKEN ZONE / SLK
35	09/05/91	LC-50/51	9.00	REPAIR A BROKEN ZONE W/ A 2" CLAY SEAM W/ SLK
36	09/09/91	LC-48/49	10.00	REPAIR A BROKEN ZONE W/ A 2" CLAY SEAM W/ SLK
37	11/15/91	MC-20	4.00	Repair a broken zone W/ open fractures
38	11/18/91	MC-21	2.00	Repair a broken zone W/ open fractures

TOTAL USED TO DATE 267.00 CY

Gallipolis Locks Replacement  
River Wall Founding Elevations

=====						
: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base
: No.	: Elevation	: in	: Actual	: Width	: Width	: Width
=====						
		Elevation	Elevation	change	Change	Change
=====						
: R-1	: 497.00	: 494.00	: N/A	: Cell	: Cell	: Cell
: R-2	: 497.00	: 494.00	: N/A	: Cell	: Cell	: Cell
: R-3	: 497.00	: 494.00	: N/A	: Cell	: Cell	: Cell
: R-4	: 497.00	: 494.50	: N/A	: Cell	: Cell	: Cell
: R-5	: 497.00	: 494.50	: N/A	: Cell	: Cell	: Cell
: R-6	: 497.00	: 494.50	: N/A	: Cell	: Cell	: Cell
: R-7	: 497.00	: 495.00	: N/A	: Cell	: Cell	: Cell
: R-8	: 497.00	: 495.00	: N/A	: Cell	: Cell	: Cell
: R-9	: 497.00	: 495.00	: N/A	: Cell	: Cell	: Cell
: R-10	: 497.00	: 495.50	: N/A	: Cell	: Cell	: Cell
: R-11	: 497.00	: 495.50	: N/A	: Cell	: Cell	: Cell
: R-12	: 497.00	: 495.50	: N/A	: Cell	: Cell	: Cell
: R-13	: 497.00	: 496.00	: N/A	: Cell	: Cell	: Cell
: R-14	: 497.00	: 496.50	: N/A	: Cell	: Cell	: Cell
: R-15	: 497.00	: 496.50	: N/A	: Cell	: Cell	: Cell
: R-16	: 497.00	: 496.50	: N/A	: Cell	: Cell	: Cell
: R-17	: 497.00	: 496.50	: N/A	: Cell	: Cell	: Cell
: R-18	: 497.00	: 496.50	: N/A	: Cell	: Cell	: Cell
: R-19	: 495.00	: 493.00	: 493.00	: Cell	: Cell	: Cell
: R-20	: 495.00	: 494.00	: 488.94	: NC	: NC	: NC
: R-21	: 495.00	: 494.00	: 491.74	: NC	: NC	: NC
: R-22	: 495.00	: 494.00	: 494.05	: NC	: NC	: NC
: R-23	: 481.00	: 482.50	: 481.90	: NC	: NC	: NC
: R-24	: 481.00	: NC	: 481.09	: NC	: NC	: NC
: R-25	: 481.00	: NC	: 481.11	: NC	: NC	: NC
: R-26	: 481.00	: NC	: 480.76	: NC	: NC	: NC
: R-27	: 481.00	: NC	: 479.86	: NC	: NC	: NC
: R-28	: 469.00	: NC	: 467.87	: NC	: NC	: NC
: R-29	: 469.00	: NC	: 469.10	: NC	: NC	: NC
: R-30	: 480.00	: NC	: 477.55	: NC	: NC	: NC
: R-31	: 480.00	: NC	: 479.27	: NC	: NC	: NC
: R-32	: 480.00	: NC	: 479.49	: NC	: NC	: NC
: R-33	: 480.00	: 478.00	: 476.51	: NC	: NC	: NC
: R-34	: 480.00	: 476.50	: 475.99	: NC	: NC	: NC
: R-35	: 480.00	: 478.00	: 477.91	: NC	: 4.50	: 57.00
: R-36	: 480.00	: NC	: 479.11	: NC	: NC	: NC
: R-37	: 480.00	: NC	: 479.31	: NC	: NC	: NC
: R-38	: 480.00	: NC	: 478.37	: NC	: NC	: NC
: R-39	: 480.00	: 478.00	: 477.06	: NC	: NC	: NC
: R-40	: 480.00	: NC	: 479.80	: NC	: 7.50	: 58.00
: R-41	: 480.00	: NC	: 479.87	: NC	: NC	: NC
: R-42	: 480.00	: 483.00	: 482.46	: NC	: NC	: NC
: R-43	: 480.00	: 483.00	: 482.80	: NC	: NC	: NC
: R-44	: 480.00	: 483.00	: 482.75	: NC	: NC	: NC
: R-45	: 480.00	: 483.00	: 482.75	: NC	: NC	: NC
: R-46	: 480.00	: 483.00	: 482.53	: NC	: NC	: NC
=====						

# Gallipolis Locks Replacement

## River Wall Founding Elevations

=====							
: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base	:
: No.	: Elevation:	: in	: Actual	: Width	: Width	: Width	:
:	:	: Elevation:	: Elevation:	: change:	: Change	: Change	:
=====							
: R-47	: 480.00	: NC	: 478.88	: NC	: NC	: NC	:
: R-48	: 480.00	: 479.00	: 478.67	: NC	: NC	: NC	:
: R-49	: 480.00	: NC	: 479.97	: NC	: NC	: NC	:
: R-50	: 480.00	: NC	: 478.89	: NC	: NC	: NC	:
: R-51	: 480.00	: NC	: 479.68	: NC	: NC	: NC	:
: R-52	: 480.00	: NC	: 479.70	: NC	: NC	: NC	:
: R-53	: 480.00	: NC	: 480.15	: NC	: NC	: NC	:
: R-54	: 480.00	: NC	: 479.75	: NC	: NC	: NC	:
: R-55	: 480.00	: NC	: 478.97	: NC	: NC	: NC	:
: R-56	: 480.00	: NC	: 479.81	: NC	: NC	: NC	:
: R-57	: 480.00	: NC	: 479.76	: NC	: NC	: NC	:
: R-58	: 480.00	: NC	: 480.14	: NC	: NC	: NC	:
: R-59	: 480.00	: NC	: 479.62	: NC	: NC	: NC	:
: R-60	: 480.00	: NC	: 479.99	: NC	: NC	: NC	:
: R-61	: 480.00	: NC	: 479.23	: NC	: NC	: NC	:
: R-62	: 484.00	: 483.00	: 482.82	: NC	: NC	: NC	:
: R-63	: 484.00	: NC	: 483.47	: NC	: NC	: NC	:
: R-64	: 484.00	: NC	: 483.75	: NC	: NC	: NC	:
: R-65	: 484.00	: NC	: 483.80	: NC	: NC	: NC	:
: R-66	: 484.00	: NC	: 483.60	: NC	: NC	: NC	:
: R-67	: 484.00	: NC	: 483.80	: NC	: NC	: NC	:
: R-68	: 484.00	: NC	: 483.50	: NC	: NC	: NC	:
: R-69	: 484.00	: NC	: 483.50	: NC	: NC	: NC	:
: R-70	: 478.00	: NC	: 477.33	: NC	: NC	: NC	:
: R-71	: 478.00	: NC	: 478.10	: NC	: NC	: NC	:
: R-72	: 484.00	: 482.00	: 480.77	: NC	: NC	: NC	:
: R-73	: 484.00	: NC	: 483.50	: NC	: NC	: NC	:
: R-74	: 484.00	: NC	: 483.50	: NC	: NC	: NC	:
: R-75	: 484.00	: NC	: 483.40	: NC	: NC	: NC	:
: R-76	: 484.00	: NC	: 483.50	: NC	: NC	: NC	:
: R-77	: 484.00	: NC	: 483.00	: NC	: NC	: NC	:
: R-78	: 484.00	: NC	: 483.96	: NC	: NC	: NC	:
: R-79	: 484.00	: NC	: 483.00	: NC	: NC	: NC	:
: R-80	: 484.00	: 483.00	: 483.80	: NC	: NC	: NC	:
: R-81	: 484.00	: 483.00	: 482.92	: NC	: NC	: NC	:
: R-82	: 484.00	: 483.00	: 482.79	: NC	: NC	: NC	:
: R-83	: 484.00	: 483.00	: 482.61	: NC	: NC	: NC	:
: R-84	: 484.00	: 483.00	: 482.66	: NC	: NC	: NC	:
: R-85	: 484.00	: 483.00	: 482.80	: NC	: NC	: NC	:
: R-86	: 484.00	: 483.00	: 482.70	: NC	: NC	: NC	:
: R-87	: 484.00	: 483.00	: 482.80	: NC	: NC	: NC	:
: R-88	: 484.00	: 483.00	: 482.70	: NC	: NC	: NC	:
: R-89	: 484.00	: 483.00	: 482.70	: NC	: NC	: NC	:
: R-90	: 484.00	: 483.00	: 482.60	: NC	: NC	: NC	:
: R-91	: 484.00	: 483.00	: 483.00	: NC	: NC	: NC	:
: R-92	: 484.00	: 482.00	: 481.80	: NC	: NC	: NC	:

Gallipolis Locks Replacement  
River Wall Founding Elevations

=====							
: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base	:
: No.	: Elevation:	: in	: Actual	: Width	: Width	: Width	:
: =====	: =====	: =====	: =====	: change:	: Change	: Change	:
: R-93	: 484.00	: NC	: 483.06	: NC	: NC	: NC	:
: R-94	: 484.00	: 483.00	: 482.00	: NC	: NC	: NC	:
: R-95	: 484.00	: 482.00	: 482.24	: NC	: NC	: NC	:
=====							

# Gallipolis Locks Replacement

## River Culvert Foundation Elevations

=====							
: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base	:
: No.	: Elevation:	: in	: Actual	: Width	: Width	: Width	:
:	:	: Elevation:	: Elevation:	: change:	: Change	: Change	:
=====							
: RC-1	: 470.00	: NC	: 470.00	: NC	: NC	: NC	:
: RC-2	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: RC-3	: 470.00	: NC	: 469.70	: NC	: NC	: NC	:
: RC-4	: 470.00	: NC	: 469.70	: NC	: NC	: NC	:
: RC-5	: 470.00	: NC	: 469.50	: NC	: NC	: NC	:
: RC-6	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: RC-7	: 470.00	: NC	: 469.60	: NC	: NC	: NC	:
: RC-8	: 470.00	: NC	: 470.00	: NC	: NC	: NC	:
: RC-9	: 470.00	: NC	: 469.90	: NC	: NC	: NC	:
: RC-10	: 470.00	: NC	: 469.60	: NC	: NC	: NC	:
: RC-11	: 470.00	: NC	: 469.20	: NC	: NC	: NC	:
: RC-12	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: RC-13	: 470.00	: NC	: 470.10	: NC	: NC	: NC	:
: RC-14	: 475.00	: NC	: 473.40	: NC	: NC	: NC	:
: RC-15	: 480.00	: NC	: 480.01	: NC	: NC	: NC	:
: RC-16	: 485.00	: NC	: 484.20	: NC	: NC	: NC	:
: RC-17	: 485.00	: NC	: 484.37	: NC	: NC	: NC	:
: RC-18	: 485.00	: NC	: 484.50	: NC	: NC	: NC	:
: RC-19	: 485.00	: NC	: 484.60	: NC	: NC	: NC	:
: RC-20	: 485.00	: NC	: 484.77	: NC	: NC	: NC	:
: RC-21	: 485.00	: NC	: 484.40	: NC	: NC	: NC	:
: RC-22	: 485.00	: NC	: 484.50	: NC	: NC	: NC	:
: RC-23	: 495.00	: NC	: 494.60	: NC	: NC	: NC	:
: RC-24	: 495.00	: NC	: 495.00	: NC	: NC	: NC	:
: RC-25	: 495.00	: NC	: 494.90	: NC	: NC	: NC	:
: RC-26	: 495.00	: NC	: 494.70	: NC	: NC	: NC	:
: RC-27	: 495.00	: NC	: 494.40	: NC	: NC	: NC	:
: RC-28	: 495.00	: NC	: 494.70	: NC	: NC	: NC	:
: RC-29	: 495.00	: NC	: 495.00	: NC	: NC	: NC	:
: RC-30	: 495.00	: NC	: 495.00	: NC	: NC	: NC	:
=====							

# Gallipolis Locks Replacement

## Middle Wall Founding Elevations

=====						
: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base
: No.	: Elevation:	: in	: Actual	: Width	: Width	: Width
=====						
		Elevation:	Elevation:	change:	Change	Change
=====						
: M-1	: 480.00	: NC	: 479.69	: NC	: NC	: NC
: M-2	: 480.00	: NC	: 479.87	: NC	: NC	: NC
: M-3	: 480.00	: 479.50	: 479.15	: NC	: NC	: NC
: M-4	: 469.00	: NC	: 468.55	: NC	: NC	: NC
: M-5	: 469.00	: NC	: 468.62	: NC	: NC	: NC
: M-6	: 469.00	: NC	: 468.80	: NC	: NC	: NC
: M-7	: 474.00	: NC	: 473.50	: NC	: NC	: NC
: M-8	: 474.00	: NC	: 473.87	: NC	: NC	: NC
: M-9	: 474.00	: 476.00	: 475.30	: Omit	: NC	: 42.00
: M-10	: 474.00	: 476.00	: 475.84	: Omit	: NC	: 42.00
: M-11	: 474.00	: 476.00	: 474.58	: NC	: NC	: NC
: M-12	: 480.00	: 476.00	: 475.82	: NC	: NC	: NC
: M-13	: 480.00	: NC	: 479.64	: NC	: NC	: NC
: M-14	: 480.00	: NC	: 480.05	: NC	: NC	: NC
: M-15	: 484.00	: NC	: 483.25	: NC	: NC	: NC
: M-16	: 484.00	: NC	: 483.46	: NC	: NC	: NC
: M-17	: 484.00	: NC	: 484.11	: NC	: NC	: NC
: M-18	: 484.00	: NC	: 484.10	: NC	: NC	: NC
: M-19	: 484.00	: NC	: 483.93	: NC	: NC	: NC
: M-20	: 484.00	: NC	: 483.87	: NC	: NC	: NC
: M-21	: 484.00	: NC	: 483.78	: NC	: NC	: NC
: M-22	: 484.00	: NC	: 483.26	: NC	: NC	: NC
: M-23	: 484.00	: NC	: 483.26	: NC	: NC	: NC
: M-24	: 482.00	: 484.00	: 483.69	: NC	: NC	: NC
: M-25	: 482.00	: 480.00	: 479.03	: NC	: NC	: NC
: M-26	: 479.00	: 480.00	: 477.59	: NC	: NC	: NC
: M-27	: 479.00	: NC	: 478.95	: NC	: NC	: NC
: M-28	: 479.00	: NC	: 479.05	: NC	: NC	: NC
: M-29	: 479.00	: 478.00	: 477.15	: NC	: NC	: NC
: M-30	: 479.00	: NC	: 479.09	: NC	: NC	: NC
: M-31	: 479.00	: NC	: 478.27	: NC	: NC	: NC
: M-32	: 479.00	: NC	: 479.20	: NC	: NC	: NC
: M-33	: 480.00	: NC	: 479.78	: NC	: NC	: NC
: M-34	: 480.00	: NC	: 480.02	: NC	: NC	: NC
: M-35	: 484.00	: 482.50	: 482.35	: NC	: 3.00	: 48.00
: M-36	: 484.00	: 483.00	: 483.18	: NC	: NC	: NC
: M-37	: 484.00	: NC	: 482.81	: NC	: NC	: NC
: M-38	: 484.00	: 483.50	: 483.26	: NC	: NC	: NC
: M-39	: 484.00	: 482.00	: 481.98	: NC	: NC	: NC
: M-40	: 484.00	: 482.00	: 481.35	: NC	: NC	: NC
: M-41	: 484.00	: 482.00	: 481.41	: NC	: NC	: NC
: M-42	: 484.00	: 483.00	: 482.86	: NC	: NC	: NC
: M-43	: 484.00	: 483.00	: 482.76	: NC	: NC	: NC
=====						

# Gallipolis Locks Replacement

## Middle Culvert Foundation Elevations

=====							
: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base	:
: No.	: Elevation:	: in	: Actual	: Width	: Width	: Width	:
: =====	: =====	: =====	: =====	: =====	: =====	: =====	: =====
: MC-1	: 470.00	: NC	: 469.06	: NC	: NC	: NC	:
: MC-2	: 470.00	: NC	: 469.96	: NC	: NC	: NC	:
: MC-3	: 470.00	: NC	: 469.70	: NC	: NC	: NC	:
: MC-4	: 470.00	: NC	: 469.50	: NC	: NC	: NC	:
: MC-5	: 470.00	: NC	: 469.51	: NC	: NC	: NC	:
: MC-6	: 470.00	: NC	: 469.88	: NC	: NC	: NC	:
: MC-7	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: MC-8	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: MC-9	: 470.00	: NC	: 469.83	: NC	: NC	: NC	:
: MC-10	: 470.00	: NC	: 469.88	: NC	: NC	: NC	:
: MC-11	: 470.00	: NC	: 469.50	: NC	: NC	: NC	:
: MC-12	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: MC-13	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: MC-14	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: MC-15	: 470.00	: NC	: 469.40	: NC	: NC	: NC	:
: MC-16	: 470.00	: NC	: 469.80	: NC	: NC	: NC	:
: MC-17	: 470.00	: NC	: 469.60	: NC	: NC	: NC	:
: MC-18	: 470.00	: NC	: 469.70	: NC	: NC	: NC	:
: MC-19	: 493.00	: NC	: 491.50	: NC	: NC	: NC	:
: MC-20	: 493.00	: NC	: 491.20	: NC	: NC	: NC	:
: MC-21	: 493.00	: NC	: 491.50	: NC	: NC	: NC	:
: MC-22	: 493.00	: NC	: 491.60	: NC	: NC	: NC	:
: MC-23	: 493.00	: NC	: 492.50	: NC	: NC	: NC	:
: MC-24	: 493.00	: NC	: 492.10	: NC	: NC	: NC	:
=====							

# Gallipolis Locks Replacement

## Land Wall Founding Elevations

Mono No.	Plan Elevation	Changes in Elevation	Average Actual Elevation	toe Width change	Heel Width	Base Width Change
L-1	484.00	NC	483.77	NC	NC	NC
L-2	484.00	NC	483.77	NC	NC	NC
L-3	484.00	NC	483.83	NC	NC	NC
L-4	484.00	NC	483.67	NC	NC	NC
L-5	469.00	NC	468.60	NC	NC	NC
L-6	469.00	NC	468.00	NC	NC	NC
L-7	479.00	477.50	477.46	NC	NC	NC
L-8	479.00	478.50	477.50	NC	NC	NC
L-9	480.00	479.50	478.13	NC	NC	NC
L-10	480.00	476.00	476.00	NC	NC	NC
L-11	480.00	NC	478.50	NC	NC	NC
L-12	480.00	NC	479.00	NC	NC	NC
L-13	480.00	479.50	479.00	NC	NC	NC
L-14	480.00	481.50	479.50	NC	NC	NC
L-15	480.00	481.50	481.36	NC	NC	NC
L-16	480.00	NC	478.00	NC	NC	NC
L-17	480.00	NC	479.78	NC	NC	NC
L-18	480.00	NC	479.00	NC	NC	NC
L-19	480.00	NC	479.00	NC	NC	NC
L-20	480.00	478.00	477.50	NC	NC	NC
L-21	480.00	NC	478.00	NC	6.50	59.00
L-22	478.00	477.50	477.50	NC	NC	NC
L-23	478.00	NC	477.50	NC	NC	NC
L-24	478.00	NC	477.50	NC	NC	NC
L-25	478.00	NC	477.89	NC	NC	NC
L-26	484.00	481.00	480.50	NC	NC	NC
L-27	484.00	481.00	480.36	NC	NC	NC
L-28	484.00	481.00	479.36	NC	NC	NC
L-29	484.00	481.00	479.27	NC	NC	NC

# Gallipolis Locks Replacement

## Land Culvert Foundation Elevations

=====							
Mono	Plan	Changes	Average	toe	Heel	Base	
No.	Elevation	in	Actual	Width	Width	Width	
=====							
		Elevation	Elevation	change	Change	Change	
=====							
LC-1	470.00	NC	469.43	NC	NC	NC	
LC-2	470.00	NC	469.43	NC	NC	NC	
LC-3	470.00	NC	469.43	NC	NC	NC	
LC-4	470.00	NC	469.67	NC	NC	NC	
LC-5	470.00	NC	469.25	NC	NC	NC	
LC-6	470.00	NC	469.47	NC	NC	NC	
LC-7	470.00	NC	470.03	NC	NC	NC	
LC-8	470.00	NC	469.99	NC	NC	NC	
LC-9	470.00	NC	470.02	NC	NC	NC	
LC-10	470.00	NC	470.20	NC	NC	NC	
LC-11	470.00	NC	470.35	NC	NC	NC	
LC-12	470.00	NC	469.35	NC	NC	NC	
LC-13	470.00	NC	469.70	NC	NC	NC	
LC-14	470.00	NC	469.70	NC	NC	NC	
LC-15	470.00	NC	469.70	NC	NC	NC	
LC-16	470.00	NC	470.12	NC	NC	NC	
LC-17	470.00	NC	470.47	NC	NC	NC	
LC-18	470.00	NC	470.36	NC	NC	NC	
LC-19	470.00	NC	470.25	NC	NC	NC	
LC-20	470.00	NC	470.10	NC	NC	NC	
LC-21	470.00	NC	470.05	NC	NC	NC	
LC-22	470.00	NC	469.90	NC	NC	NC	
LC-23	470.00	NC	469.90	NC	NC	NC	
LC-24	470.00	NC	469.70	NC	NC	NC	
LC-25	470.00	NC	469.40	NC	NC	NC	
LC-26	470.00	NC	470.00	NC	NC	NC	
LC-27	470.00	NC	469.70	NC	NC	NC	
LC-28	470.00	NC	469.80	NC	NC	NC	
LC-29	470.00	NC	469.70	NC	NC	NC	
LC-30	470.00	NC	469.30	NC	NC	NC	
LC-31	479.00	NC	479.02	NC	NC	NC	
LC-32	479.00	NC	479.20	NC	NC	NC	
LC-33	479.00	NC	479.48	NC	NC	NC	
LC-34	479.00	NC	479.46	NC	NC	NC	
LC-35	479.00	NC	479.15	NC	NC	NC	
LC-36	479.00	NC	479.00	NC	NC	NC	
LC-37	479.00	NC	479.00	NC	NC	NC	
LC-38	479.00	NC	478.80	NC	NC	NC	
LC-39	479.00	NC	479.00	NC	NC	NC	
LC-40	479.00	NC	478.50	NC	NC	NC	
LC-41	479.00	NC	477.60	NC	NC	NC	
LC-42	479.00	NC	478.10	NC	NC	NC	
LC-43	479.00	NC	478.30	NC	NC	NC	
LC-44	479.00	NC	477.90	NC	NC	NC	
LC-45	479.00	NC	478.50	NC	NC	NC	
LC-46	479.00	NC	478.00	NC	NC	NC	

# Gallipolis Locks Replacement

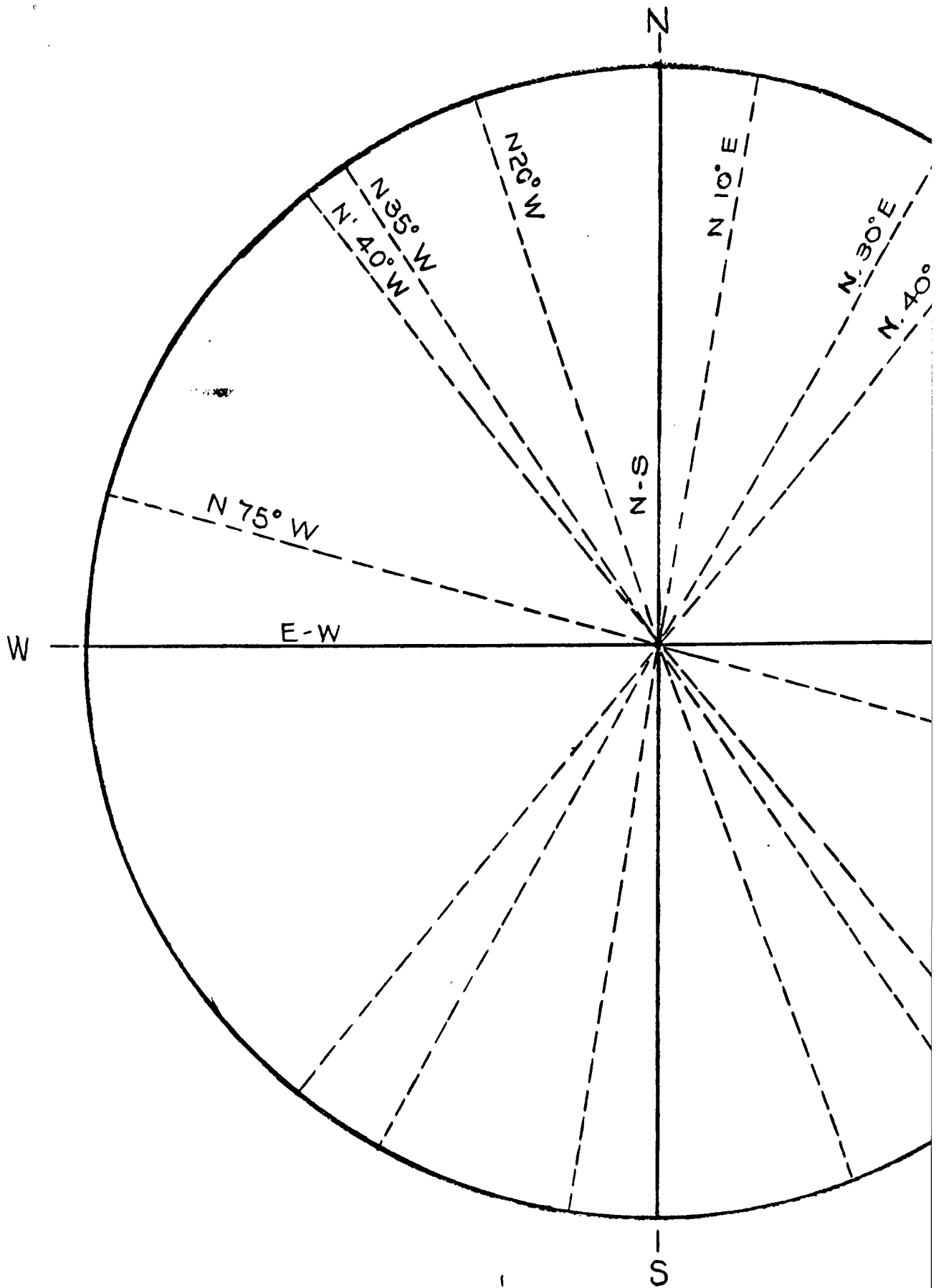
## Land Culvert Foundation Elevations

=====							
: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base	:
: No.	: Elevation	: in	: Actual	: Width	: Width	: Width	:
:	:	: Elevation	: Elevation	: change	: Change	: Change	:
=====							
: LC-47:	479.00	: NC	: 477.90	: NC	: NC	: NC	:
: LC-48:	479.00	: NC	: 478.00	: NC	: NC	: NC	:
: LC-49:	479.00	: NC	: 478.10	: NC	: NC	: NC	:
: LC-50:	479.00	: NC	: 477.80	: NC	: NC	: NC	:
: LC-51:	479.00	: NC	: 477.80	: NC	: NC	: NC	:
: LC-52:	479.00	: NC	: 478.00	: NC	: NC	: NC	:
: LC-53:	479.00	: NC	: 477.90	: NC	: NC	: NC	:
: LC-54:	479.00	: NC	: 477.70	: NC	: NC	: NC	:
: LC-55:	479.00	: NC	: 477.30	: NC	: NC	: NC	:
: LC-56:	479.00	: NC	: 477.50	: NC	: NC	: NC	:
: LC-57:	479.00	: NC	: 478.20	: NC	: NC	: NC	:
: LC-58:	479.00	: NC	: 478.40	: NC	: NC	: NC	:
: LC-59:	479.00	: NC	: 478.00	: NC	: NC	: NC	:
=====							

# Gallipolis Locks Replacement

## FOUNDATION ELEVATIONS FOR UPSTREAM & DOWNSTREAM SILLS

: Mono	: Plan	: Changes	: Average	: toe	: Heel	: Base
: No.	: Elevation:	: in	: Actual	: Width	: Width	: Width
:	:	: Elevation:	: Elevation:	: change:	: Change	: Change
: BS-1 :	480.00 :	N/C :	479.60 :	N/C :	N/C :	N/C :
: BS-2 :	480.00 :	N/C :	479.60 :	N/C :	N/C :	N/C :
: BS-3 :	480.00 :	N/C :	479.60 :	N/C :	N/C :	N/C :
: BS-4 :	480.00 :	N/C :	479.77 :	N/C :	N/C :	N/C :
: BS-5 :	480.00 :	N/C :	479.77 :	N/C :	N/C :	N/C :
: BS-6 :	480.00 :	N/C :	479.77 :	N/C :	N/C :	N/C :
: BS-7 :	484.00 :	N/C :	482.63 :	N/C :	N/C :	N/C :
: BS-8 :	484.00 :	N/C :	482.63 :	N/C :	N/C :	N/C :
: BS-9 :	484.00 :	N/C :	482.63 :	N/C :	N/C :	N/C :
: BS-10 :	484.00 :	N/C :	481.78 :	N/C :	N/C :	N/C :
: BS-11 :	484.00 :	N/C :	481.78 :	N/C :	N/C :	N/C :
: BS-12 :	484.00 :	N/C :	481.78 :	N/C :	N/C :	N/C :
: MG-1 :	484.00 :	N/C :	483.25 :	N/C :	N/C :	N/C :
: MG-2 :	484.00 :	N/C :	483.25 :	N/C :	N/C :	N/C :
: MG-3 :	484.00 :	N/C :	483.25 :	N/C :	N/C :	N/C :
: MG-4 :	484.00 :	N/C :	483.64 :	N/C :	N/C :	N/C :
: MG-5 :	484.00 :	N/C :	483.64 :	N/C :	N/C :	N/C :
: MG-6 :	484.00 :	N/C :	483.64 :	N/C :	N/C :	N/C :
: MG-7 :	484.00 :	N/C :	483.70 :	N/C :	N/C :	N/C :
: MG-8 :	484.00 :	N/C :	483.70 :	N/C :	N/C :	N/C :
: MG-9 :	484.00 :	N/C :	483.70 :	N/C :	N/C :	N/C :
: MG-10 :	484.00 :	N/C :	481.04 :	N/C :	N/C :	N/C :
: MG-11 :	484.00 :	N/C :	481.04 :	N/C :	N/C :	N/C :
: MG-12 :	484.00 :	N/C :	481.04 :	N/C :	N/C :	N/C :
: EMG-1 :	484.00 :	N/C :	483.02 :	N/C :	N/C :	N/C :
: EMG-2 :	484.00 :	N/C :	483.02 :	N/C :	N/C :	N/C :
: EMG-3 :	484.00 :	N/C :	483.02 :	N/C :	N/C :	N/C :
: EMG-4 :	478.50 :	N/C :	478.42 :	N/C :	N/C :	N/C :
: EMG-5 :	478.50 :	N/C :	478.42 :	N/C :	N/C :	N/C :
: EMG-6 :	478.50 :	N/C :	478.42 :	N/C :	N/C :	N/C :

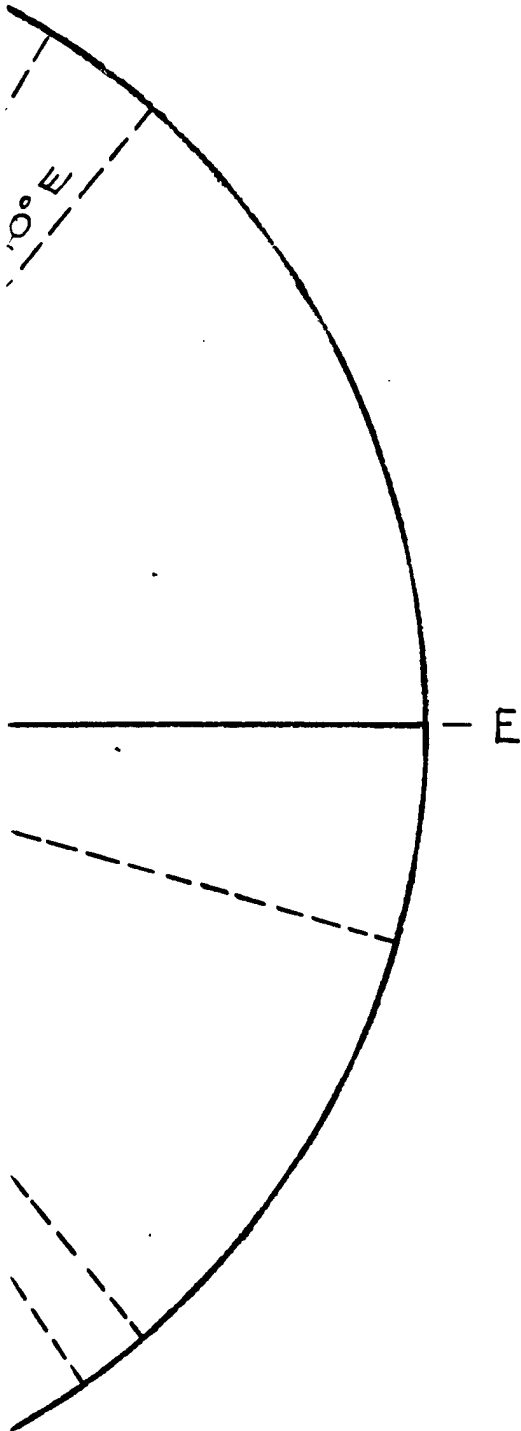


# MAJOR

N 35° W  
E - W  
N 20° E  
N 40° E  
N 20° W  
N-S

# MINOR

N-75 W  
N 10 E  
N 30 E  
N 40 W



Gallipolis Lock and Dam  
Lock In Canal  
Joint Direction

Q

11-H-1

**PUMPING TEST ON GROUNDWATER CONTROL SYSTEM  
FOR GALLIPOLIS LOCK EXCAVATION  
Ohio River**

**Report to**

**U S ARMY CORPS OF ENGINEERS  
HUNTINGTON DISTRICT  
Huntington, West Virginia**

**November 22, 1988**

**By**

**CHARLES MANSUR, PE  
GEOTECHNICAL ENGINEERING CONSULTANT**

# PUMPING TEST ON GROUNDWATER CONTROL SYSTEM FOR GALLIPOLIS LOCK EXCAVATION

## INTRODUCTION

In order to facilitate digging the excavation for construction of the second Gallipolis Lock, a slurry cutoff wall was constructed around the excavation down through the alluvial sands to rock to prevent seepage into the excavation. Thirty six wells were installed within the area of the excavation to pump out the groundwater trapped within the cutoff wall. Eleven piezometers were installed inside and eight outside of the cutoff wall for checking the efficiency of the cutoff and predrainage system. The locations of the cutoff wall, predrainage wells, and the piezometers are shown on Plates 1 and 2.

The specifications for this work required that a full scale pumping test be made on the predrainage well system after installation of the slurry wall and the well system. The slurry cutoff wall was completed to the cellular coffercells at the downstream end of the excavation on 3 Aug 1988. Connection of the slurry cutoff to the coffercells was completed on Aug 22; the tie-in from the cells to the guidewall for the existing lock was completed on Aug 29 (see Plate 1). These small openings in the cutoff wall were still open at the time the pumping test was made. All of the predrainage wells had been installed by the time the pumping test was made but Wells 22 and 23 had been removed by the contractor because of interference with his excavation before the pumping test was made.

All of the piezometers shown on Plate 1 had been installed but Piezs 6, 7, 12, 13, and 17 had been removed by the contractor prior to start of the pumping test. Piezs 12, 13, and 17 were reinstalled prior to start of the pumping test. Piez 19 was also installed just prior to start of the pumping test. Piezs 4 and 10 were located adjacent to Wells 18 and 29, and were not included in this study. Although the pumping test on the predrainage well system was supposed to have been made prior to the start of any excavation or before any individual wells were pumped, the contractor had started to pump Wells 1, 2, 3, 4, 5, 6, 7, and 8 on Aug 4. [A few of the wells may have been pumped prior Aug 4.]

Pumping Wells 1-8 was started on Aug 5 shortly after the slurry cutoff wall was completed. Pumping the remainder of the predrainage wells was started at 7 pm on Aug 25 and was continued until Oct 30 when the groundwater within the excavation had been lowered about as low as practical by pumping from the predrainage wells.

CHARLES MANSUR, P E  
Geotechnical Engineering Consultant

9921 St Charles Rock Road  
St Ann (St Louis), Missouri 63074  
(314)428-8880

22 November 1988

Mr. Craig Avery, V P  
Fuller, Mossbarger, Scott and May  
1409 Forbes Road  
Lexington, KY 40505

Re: Charles Mansur (Consultant)  
Contract #DACW6987-D-0037  
Geotechnical Engineering Monitoring  
Pumping Test on Groundwater Control System  
for Gallipolis Lock Excavation

Dear Mr Avery:

Submitted herewith is my analysis of the pumping test recently made on the groundwater control system for the excavation for construction of the second Gallipolis Lock in accordance with the above referenced contract.

If you have any questions regarding my analysis of the pumping test made on this system, I shall be glad to answer them.

Sincerely,

*Charles Mansur*

Charles Mansur, PE  
Consultant

cc: James Coffman (5 copies)  
Chief, Geotechnical Branch  
Huntington District  
U S Army Corps of Engineers

## BASIC PUMPING TEST DATA

Basic groundwater and pumping test data are summarized in the following tabulation.

Started pumping some wells .....	In June 1988
Started pumping Wells 1-8 in downstream area of excavation .....	Aug 5, 1988
Average groundwater level within excavation on 16 June 1988 .....	530.3 msl
Average groundwater level within excavation on 25 Oct 1988 .....	505.0 msl
Predrainage wells installed .....	36
Predrainage Wells 22 and 23 removed by contractor prior to start of pumping test on Aug 25 .....	2
Number of wells pumped during pumping test and until Oct 25 .....	34
Start of pumping test .....	7:00 pm 25 Aug 1988
Completion of pumping test .....	7:00 pm 27 Aug 1988
Duration of pumping test .....	48 hours
Total pumping time after 25 Aug 1988 .....	60 days
Observation of piezometers continued for 60 days after pumping test (to) .....	30 Oct 1988
Maximum capacity of pumps in wells .....	300-400 gpm
Average rate of pumping on 8:00 pm 25 Aug 1988 .....	275 gpm/well
Average rate of pumping on 7:00 pm 27 Aug 1988 .....	227 gpm/well
Upper pool elevation at start of pumping test .....	539.3 msl
Lower pool elevation at start of pumping test .....	516.6 msl
Fall in pool levels during (August 25-27) pumping test .....	0.3 ft
After completion of pumping test, upper and lower pools rose .....	0.5* ft
Average groundwater level in excavation at start of pumping test .....	521.0 msl
Average groundwater level in excavation after 64 days of pumping .....	505.0
Average water level in predrainage wells after 64 days of pumping .....	504.2

## Average drawdown in excavation

During 48-hr pumping test Piezs (2, 3, 5, 9, & 11) .....	3.75 ft
From start of pumping to 25 Oct 1988 (Piezs 1, 2, 3, 5, 8, 9, & 11)	25.8 ft
Effective days of pumping 34 wells .....	63.5 days

Specific yield of sand formation being drained based on 100 hrs of pumping at an average pumping rate of 230 gpm .....	18%
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The GWT at each of the piezometers is shown on Plate 1 for 16 June 1988 prior to closure of the cutoff and 25 October 1988 (after 60 days of pumping 34 wells)

## ANALYSIS OF PUMPING TEST DATA

As installation of the groundwater cutoff wall around the excavations had a significant effect on the groundwater level, the sequence and dates of construction of the cutoff wall are given in the following summary and are plotted on Plate 4.

Installation of slurry wall started going north at about Piez 15 .....	13 Aug 1988
Installation of slurry wall to Piez 12 .....	24 May 1988
Slurry Wall tied into upstream end of Lock .....	29 June 1988
Installation of slurry wall started going south at about Piez 15 .....	30 June 1988
Completed (slurry) cutoff wall to within about 40 ft of downstream coffercells .....	3 Aug 1988
Driving sheet piles from (slurry) cutoff to cells completed .....	22 Aug 1988
Driving Z piling from cells to downstream guide wall completed, .....	29 August 1988

The piezometric data plotted on Plate 1 show that the GWT inside of the lock area on 16 June 1988 sloped from about El 533 at the upstream end of the excavation area to about El 525 at the downstream end of the excavation area. The GWT outside of the cutoff wall sloped from about El 538 (slightly below the upper river pool) at the upstream end of the excavation area to about El 519 (slightly above the lower pool) at the downstream end of the excavation area. [This is about as might be expected with an upper pool level of El 539 and a lower pool level of El 517.] Once the cutoff wall around the lock area was closed, the GWT inside of the lock area more or less leveled out.

Pumping predrainage Wells 1, 2, 3, 4, 5, 6, 7, and 8 at the downstream end of the excavation area, lowered the GWT inside of the lock area from El 534 to 527 (or about 7 ft) at the upstream end of the excavation area and from El 525 to 515 (or about 10 ft) in the downstream end of the excavation area, prior to start of the pumping test.

The GWT inside and outside of the excavation area prior to closure of the cutoff wall and start of any pumping of the predrainage wells is shown in brackets () for the various piezometers on Plate 1. Pumping all of the predrainage wells lowered the GWT 9 to 10 ft at the upstream end of the lock area, 5 to 6 ft at the center, and 6 to 7 ft at the downstream end of the lock, during the 48-hr pumping test. Pumping the wells for another 60 days lowered the GWT within the excavation down to an average elevation of 505.0. The GWT both inside and outside of the cutoff wall is also shown on Plate 1 for each piezometer after 60 additional days of pumping all of the wells.

The average drawdown (DD) of the GWT at Piezs 2, 3, 5, 9, and 11 within the lock area is plotted vs Elapsed Pumping Time (T) for the 48-hr pumping test on Plate 3.

[As Piezs 2, 3, 5, 9, and 11 all exhibited similar drawdown characteristics, only these piezometers were averaged to plot the average DD curve on Plate 3. Piez 1 first seemed to be inoperative and was not included with the plotted data. Why Piez 8 behaved initially so differently than the other piezometers in the lock area is not known; however, the more rapid DD in Piez 8 can probably be attributed to its being located near the downstream wing wall and where there was a smaller zone of water to be pumped out by the predrainage wells along the downstream lock walls.]

The average rate of pumping,  $Q_w$ , at the start of the pumping test (8:00 pm 8/25/88) was 275 gpm; after pumping for 48 hrs, the average rate of pumping per well had diminished to 227 gpm.

Prior to starting installation of the cutoff wall around the excavation for the Gallipolis Lock, the upper pool at the existing lock was at El 538.2 and the groundwater table (GWT) at the upstream end of the excavation area was probably at about El 536. The GWT at the downstream end of the excavation was at about El 524 with the lower pool at El 516. The above differential of 12 ft in the GWT from the upper end of the excavation to the lower end can be attributed to the natural slope of the seepage gradient around the lock prior to construction of the cutoff wall out into the valley. The average GWT in the excavation area prior to construction of the cutoff was probably about El 530.

Shortly after the start (Apr 13) installation of the cutoff wall, the GWT within the excavation area started to fall and continued to fall at an increasing rate as the cutoff was completed around the excavation down to the closures at each end of the sheet pile cells at the downstream and of the excavation. This falling of the GWT within the excavation area can be attributed to pumping

a predrainage well on two and to drainage downstream to the lower lock pool as seepage from the upper pool is progressively blocked by construction of the slurry cutoff wall. Completion of the slurry cutoff wall on Aug 3 combined with starting to pump Wells 1-8 produced a marked lowering of the GWT within the excavation area (See Plate 4). Completion of the cutoff wall to the sheet pile cells (Aug 22) and starting to pump the remaining (26) predrainage wells on Aug 25 produced a rapid lowering of the GWT within the excavation area. Pumping all of the predrainage wells, except Wells 22 and 23, for an additional 60 days after the 48-hr pump test lowered the GWT in the excavation area to an average elevation of 505.0; the GWT at each piezometer during this pumping period is also plotted vs date on Plate 4 and is shown at the end of the pumping period on Plate 1. The water level in each of the wells prior to start of the pumping test and 64 days later is also plotted on Plate 1. It may be noted that the water level in the wells was maintained at El 503 to 506 after Sept 1.

The average groundwater level in the lock area had been lowered to approximately El 521 by the contractor pumping Wells 1 through 8 prior to start of the pumping test. This previous drawdown (DD) of 9 ft was added to the DD's obtained during the pumping test and then the total DD plotted vs Elapsed Pumping Time on Plate 5, the basic graph of which was copied from Plate 11 in the report: *Study of Dewatering Excavation-Gallipolis Locks and Dam Replacement - Ohio River* dated 7 Oct 1983, by Mansur. When allowance is made for the capacity of the pumps being a maximum of 300 to 400 gpm rather than the 600 gpm as used for the computed graph on Plate 5, it appears that the predrainage wells and pumping system performed about as expected.

The upper and lower pool stages prior to, during, and after the pumping test are plotted on Plate 4. It may be noted that both the upper and lower pools were relatively stable, during the 48-hr pumping test, but gradually rose about 0.5 ft thereafter.

After the start of pumping Wells 1-8 in the downstream area of the excavation on Aug 5, the water level in Piez 14 outside of the slurry cutoff wall fell about 3.5 ft until the connection between the slurry wall and sheet pile cells was closed on Aug 22 (See Plate 4). This fall in the GWT at Piez 14 can probably be attributed to redistribution of the groundwater flow pattern around the blockage in the valley created by closure of the slurry cutoff and seepage from outside of the slurry wall into the area being predrained by starting to pump Wells 1-8, which lowered the GWT in the downstream end of the excavation area to about El 516 on 5 ft below what the GWT at Piez 14 had been. Similar, but less, effect of starting to pump Wells 1-8 with the gap at the sheet piling cells open, can be noted from the fall of the GWT at outside Piezs 15 and 16 which were farther from the gap in the cutoff wall at the coffercells.

After the gaps in the cutoff wall were closed, the fall in the GWT at the outside piezometers diminished. However, the GWT at all of the piezometers (12-17) outside of the slurry cutoff wall gradually fell 0.5 to 1.0 ft after pumping the entire predrainage system was started on

Oct 25. As the groundwater level was lowered inside of the slurry wall, there must have been some minor leakage through the slurry wall and/or through the underlying rock into the area being dewatered.

Regardless of whatever leakage there is through or beneath the cutoff wall, pumping the 34 predrainage wells lowered the groundwater therein about 25 ft during 60 days of pumping, or within about 4 ft of the drawdown calculated (see Plate 5). Had 600-gpm pumps been used, as assumed in the theoretical calculations, rather than 300 to 400 gpm pumps, the check between the computed and actual drawdowns and well flows would have been even some better. In any event, the cutoff wall and predrainage system seems to have performed basically as planned.

  
Charles Mansur, PE  
Geotechnical Engineering Consultant

CM:ab



Avg GWT	6/16/88	-	530.3
Avg GWT	10/25/88	-	504.5

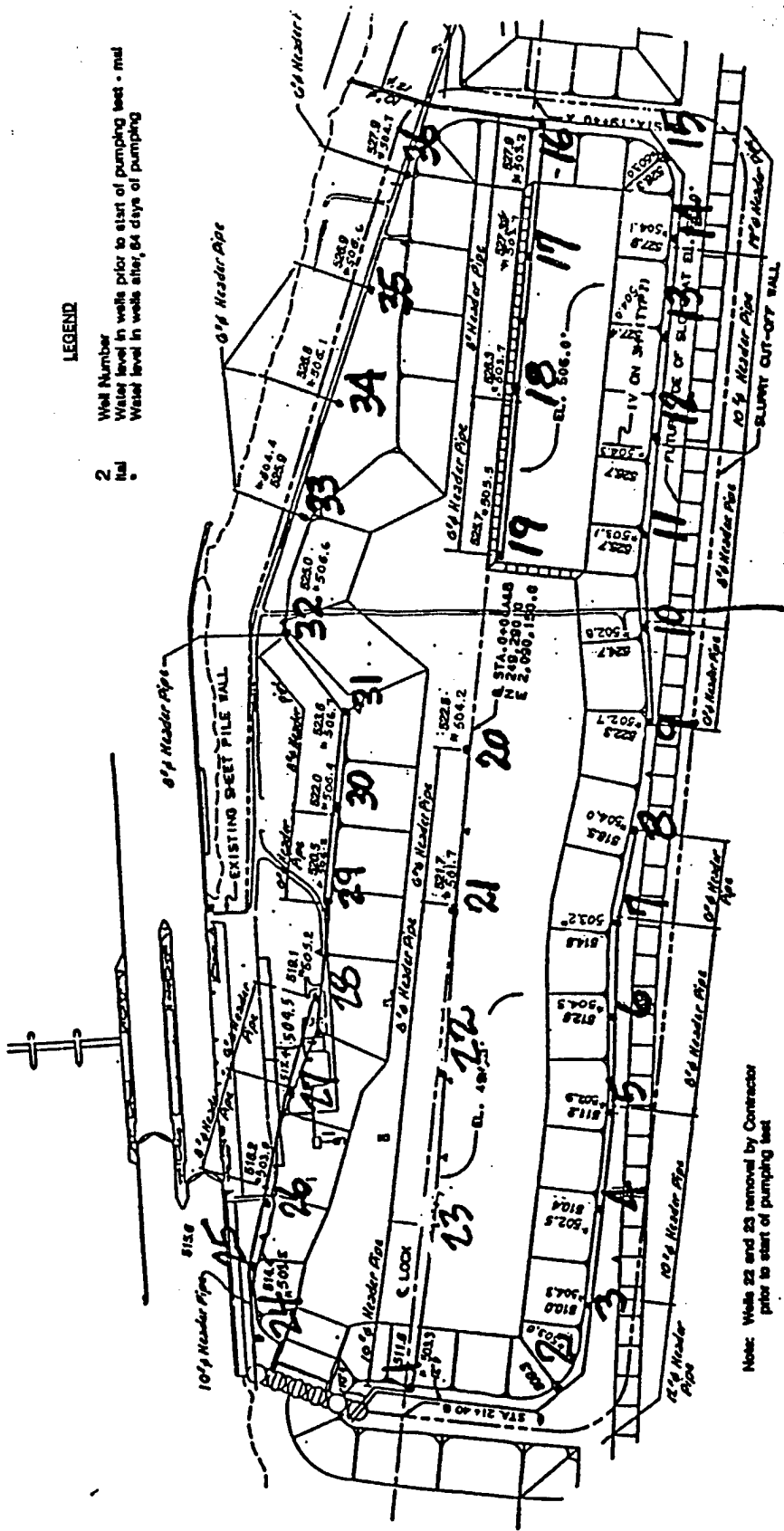
Upper Pool = 539.3 at start of pumping test

Lower Pool  
518.8

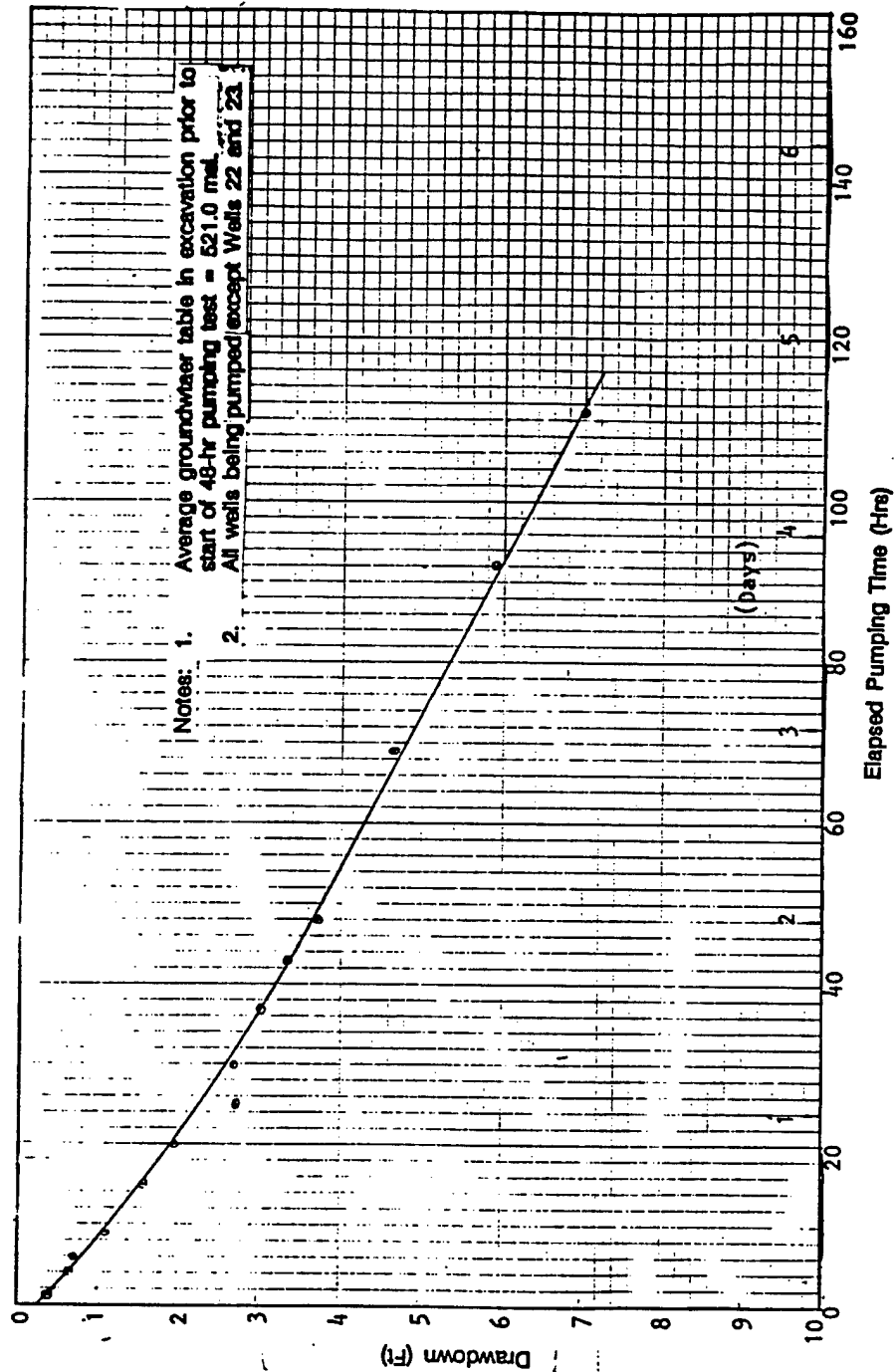
Piezometer number  
GWT 6-16-88 prior to closure of cutoff wall - mid  
GWT 25 Oct 1988 after 63.5 days of pumping

**GALLIPLUS LOCK  
GROUNDWATER TABLE AT PIEZOMETERS PRIOR TO CLOSURE  
OF SLURRY CUTOFF WALL AND  
AFTER 64 DAYS OF PUMPING**

**PLATE 1**

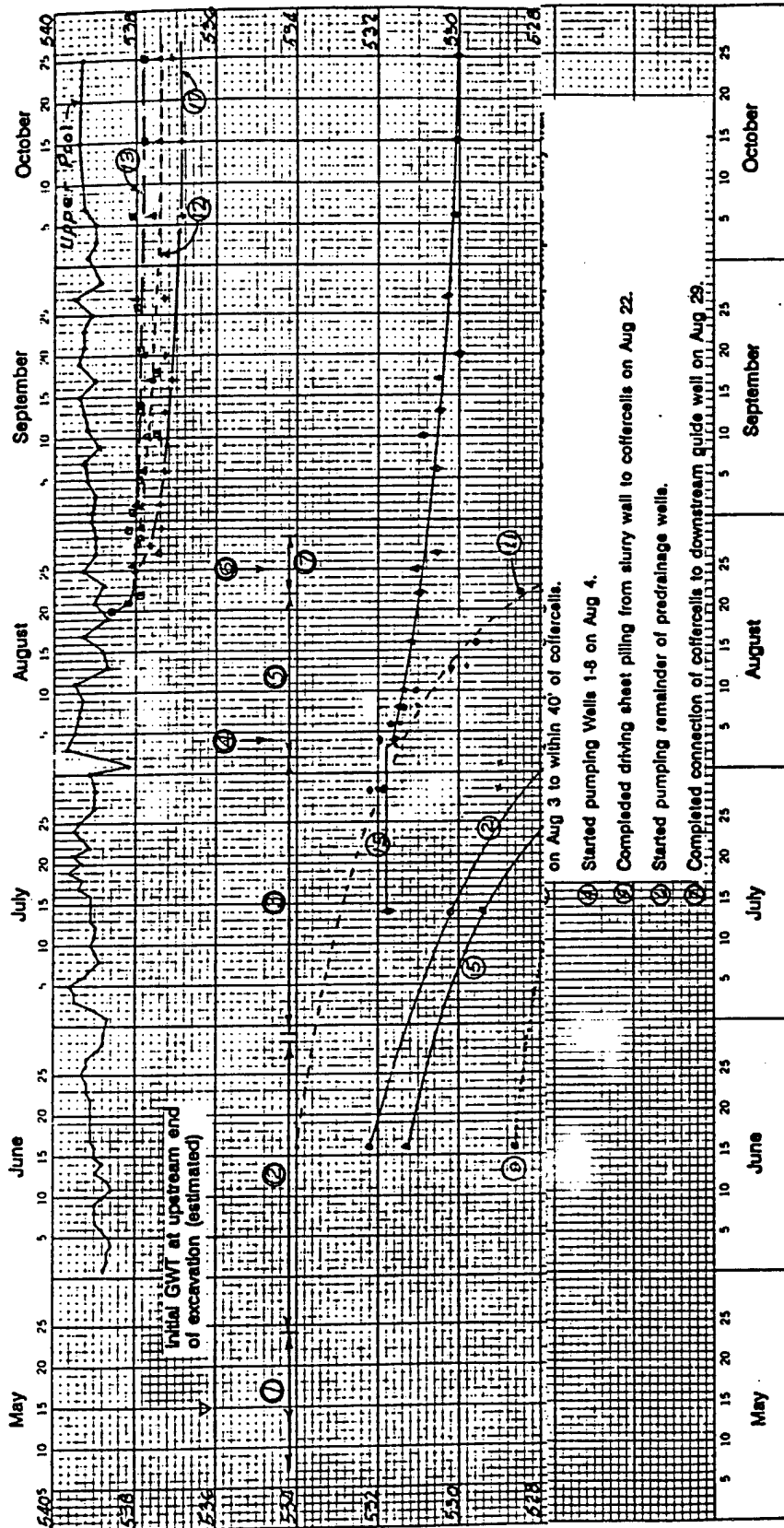


Gallopole Lock  
WATER LEVEL IN WELLS  
PRIOR TO START OF PUMPING TEST  
AND AFTER 64 DAYS OF PUMPING



Gallipolis Lock  
AVERAGE GROUNDWATER LOWERING  
vs  
ELAPSED TEST PUMPING TIME

46 2610



1988

Gallipolis Lock  
 OHIO RIVER POOL STAGES  
 AND  
 DRAWDOWN OF GROUNDWATER INSIDE  
 AND OUTSIDE OF CUTOFF WALL  
 DEVELOPED BY  
 PUMPING PREDRAINAGE WELL SYSTEM

DRAFT

PUMPING TEST ON PREDRAINAGE SYSTEM  
GALLIPOLIS LOCK  
Ohio River

Report to

U S ARMY CORPS OF ENGINEERS  
HUNTINGTON DISTRICT  
Huntington, West Virginia

November 7, 1988

By

CHARLES MANSUR, PE  
GEOTECHNICAL ENGINEERING CONSULTANT

CHARLES MANSUR, P E  
Geotechnical Engineering Consultant

9921 St Charles Rock Road  
St Ann (St Louis), Missouri 63074  
(314)428-8880

7 November 1988

Mr. Craig Avery, V P  
Fuller, Mossbarger, Scott and May  
1409 Forbes Road  
Lexington, KY 40505

Re: Charles Mansur (Consultant)  
Contract #DACW6987-D-0037  
Geotechnical Engineering Monitoring  
Gallipolis Lock  
Pumping Test on Predrainage System

Dear Mr Avery:

Submitted herewith is my analysis of the pumping test recently made by the contractor (GLR Constructors) on the predrainage well system for the excavation for construction of the second Gallipolis Lock in accordance with the above referenced contract.

If you have any questions regarding my analysis of the pumping test made on this system, I shall be glad to answer them.

Sincerely,

*Charles Mansur*

Charles Mansur  
Consultant

cc: James Coffman  
Chief, Geotechnical Branch  
Huntington District  
U S Army Corps of Engineers

# ANALYSIS OF PUMPING TEST ON PREDRAINAGE WELL SYSTEM FOR GALLIPOLIS LOCK

## INTRODUCTION

In order to facilitate digging the excavation for construction of the second Gallipolis Lock, a slurry cutoff wall was constructed around the top of the excavation, through the alluvial sands stratum at the site. Thirty six wells were also installed with the area of the excavation to pump out the groundwater trapped within the cutoff wall. A number of piezometers were installed inside and outside the wall for checking the efficiency of the cutoff and predrainage system. The locations of the cutoff wall, predrainage wells, and the piezometers are shown on Plates 1 and 2.

The specifications for this work required that a full scale pumping test be made on the predrainage well system after installation of the slurry wall and the well system were complete. The cutoff wall was completed on 17 July 1988 except for 40 ft at its connection with the downstream guidewall for the existing lock (see Plate 1). This opening in the cutoff wall was still open at the time the pumping test was made. All the predrainage wells have been installed by the time the pumping test was made but Wells 22 and 23 had been removed by the Contractor because of interference with his excavation before the test was made.

The piezometers shown on Plate 1 had been installed but Piezometers 6 and 7 had been removed by the Contractor prior to start of the pumping test. Piezs 4 and 10 were located adjacent to Wells 18 and 29, and were not included in this study. The groundwater table (GWT) at Piez 8 was plotted on Plate 4 but the readings were not included in averaging the piezometric test data because of the apparent inconsistent readings of Piez 8 during the test. Although the pumping test on the predrainage system was supposed to have been made prior to the start of any excavation or before any individual wells were pumped, some of the predrainage wells (#1, 2, 3, 4, 5, 6, 7, and 8) were being pumped by the Contractor as the test began on 25 Aug 1988. [Pumping a few of the wells may have been started prior to complete closure of the cutoff wall.]

## BASIC PUMPING TEST DATA

Basic groundwater and pumping test data are summarized in the following tabulation.

Completion of cutoff around excavation .....	17 July 1988
Start of pumping some wells .....	In June or prior to closure of cutoff
Average groundwater level within excavation on 16 June 1988 .....	530.3 msl

Average groundwater level within excavation on 25 October 1988 .....	504.5 msl
Predrainage wells installed .....	36
Predrainage wells removed (#22 and #23) by Contractor prior to start of pumping test .....	2
Wells in downstream end of lock area pumped prior to start of pumping test .....	#1 - #8
Number of wells pumped during pumping test .....	34
Start of pumping test .....	7:00 pm 25 Aug 1988
Completion of specified pumping test .....	7:00 pm 27 Aug 1988
Duration of specified pumping test .....	48 hours
Total pumping time after 25 Aug 1988 .....	60 days
Observation of piezometers continued for 60 days after start of test .....	25 Oct 1988
Approximate maximum capacity of pumps in wells .....	300 gpm
Average rate of pumping on 8:00 pm 25 Aug 1988 .....	275 gpm/well
Average rate of pumping on 7:00 pm 27 Aug 1988 .....	227 gpm
Upper pool elevation at start of pumping test .....	539.3 msl
Lower pool elevation at start of pumping test .....	516.6 msl
Fall in pool levels during August pumping test .....	0.3 ft
After completion of pumping test, Upper and Lower pools rose .....	0.5 ft
Average groundwater level in excavation at start of pumping test .....	521.0 msl
Average drawdown in excavation (Piezometers 2, 3, 5, 9, & 11)	
During 48-hr pumping test .....	3.75 ft
During 100 hrs of pumping .....	6.40 ft
During 280 hrs of pumping .....	17.1 ft
From start of pumping to 25 Oct 1988 .....	25.8 ft
Effective days of pumping with all 34 wells pumping .....	63.5 days
Specific yield of sand formation being drained based on 100 hours of pumping at an average pumping rate of 230 gpm .....	18%

Plans of the predrainage wells and piezometers used in the pumping test are shown on Plates 1 and 2. The GWT at each of the piezometers at the following dates and times on Plate 1:

16 June 1988 prior to closure of the cutoff

25 October 1988 (after 60 days of pumping all wells)

#### ANALYSIS OF PUMPING TEST DATA

The piezometric data plotted in plan on Plate 1 show that the GWT on 6/16/88 inside of the lock area sloped from about El 533 at the upstream end of the lock area to about El 525 at the downstream end of the lock area. The GWT outside of the cutoff wall sloped from about El 538 (slightly below the upper river pool) at the upstream end of the area to about El 519 (slightly above the lower pool) at the downstream end of the lock area. [This is about as might be expected with an upper pool level of El 539 and a lower pool level of El 517.] Once the cutoff wall around the lock area as closed, the GWT inside of the lock area leveled out to a certain extent.

As a result of pumping predrainage Wells 1, 2, 3, 4, 5, 6, 7, and 8 at the downstream end of the lock area, the average GWT inside of the lock area had been lowered from El 534 to 527 (or about 7 ft) at the upstream end of the lock area and from El 525 to 515 (or about 10 ft) in the downstream end of the lock area, prior to start of the pumping test.

The GWT outside of the lock area (immediately) prior to start of the pumping tests is shown by an asterisk(\*) for the various piezometers on Plate 1. During the pumping period, the GWT was lowered 9 to 10 ft at the upstream end of the lock area, 5 to 6 ft at the center, and 6 to 7 ft at the downstream end of the lock.

The average drawdown (DD) of the GWT at Piezs 2, 3, 5, 9, and 11 within the lock area are plotted vs Elapsed Pumping Time (T) on Plate 3.

As Piezs 2, 3, 5, 9, and 11 all exhibited similar drawdown characteristics, only these piezometers were averaged to plot the average DD curve on Plate 3. Piez 1 first seemed to be inoperative and was not included with the plotted data. Why Piez 8 behaved so differently than the other piezometers in the lock area is not known; however, the more rapid DD in Piez 8 can probably be attributed to its being located near the downstream wing wall and where there was a smaller zone of water to be pumped out by the predrainage wells along the downstream lock walls.

Pumping 34 predrainage wells for 110 hrs, or approximately 4-1/2 days, lowered the water level in the lock area an average of 7.0 ft (see Plate 3). The average rate of pumping  $Q_w$  at the

start of the pumping test (8:00 pm 8/25/88) was 275 gpm; after pumping for 48 hours, the rate of pumping had diminished to 227 gpm.

The average groundwater level in the lock area had been lowered approximately 9 ft by the Contractor pumping Wells 1 through 8 prior to start of the pumping test. This previous drawdown of 9 ft was added to the DD's obtained during the pumping test and then the total DD plotted vs Elapsed Pumping Time on Plate 5, the basic graph of which was copied from Plate 11 in the Charles Mansur report: *Study of Dewatering Excavation-Gallipolis Locks and Dam Replacement - Ohio River* dated 7 Oct 1983. When allowance is made for the capacity of the pumps being a maximum of 300 gpm rather than the 600 gpm rate used in computing the graphs on Plate 5, it appears that the predrainage wells and pumping system is performing about as expected.

The Upper and Lower river stages during and after the pumping test are plotted on Plate 4 until 25 Oct 1988. The readings of all operative piezometers both outside of the cutoff wall and the landside wall of the existing lock are also plotted from 16 June 1988 to 25 Oct 1988. Although the pool levels fell about 0.3 ft during the pumping test, both the Upper and Lower pools rose gradually about 0.5 ft after September 1.

After the cutoff wall was closed and pumping the predrainage well system was started, the GWT outside of the cutoff wall fell varying amounts by Oct 25 as shown in the following tabulation:

<u>Fall of GWT Outside of Cutoff</u>		
<u>Piezometer</u>	<u>From Aug 25 to Oct 25</u>	<u>From June 16 to Oct 25</u>
12	0.6 ft	0.6+ ft
13	0.6	0.6+
14	0.4	4.0
15	1.0	1.8
16	2.3	2.6
17	1.1	1.1+

As both the Upper and Lower pools were relatively stable, or rising slightly during most of the above periods, the fall in the GWT outside of the cutoff as the groundwater level was lowered inside, there must have been some leakage through the slurry wall and/or through the underlying rock into the area being dewatered. Such leakage would also have prevented the GWT inside of the cutoff wall from being lowered as fast as otherwise would have occurred.

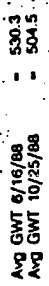
Regardless of whatever leakage there was through or beneath the cutoff wall, pumping the 34 predrainage wells lowered the groundwater therein about 26 ft during about 60 days of pumping,

or within about 3 ft of the drawdown calculated (see Plate 5). Had 600-gpm pumps been used, as assumed in the theoretical calculations, rather than 300- gpm, and had there been no seepage through or under the cutoff, the check between calculated and actual drawdowns would have been better. In any event, the cutoff well and predrainage system have worked basically as planned.

*Charles Mansur*

Charles Mansur, PE  
Geotechnical Engineering Consultant

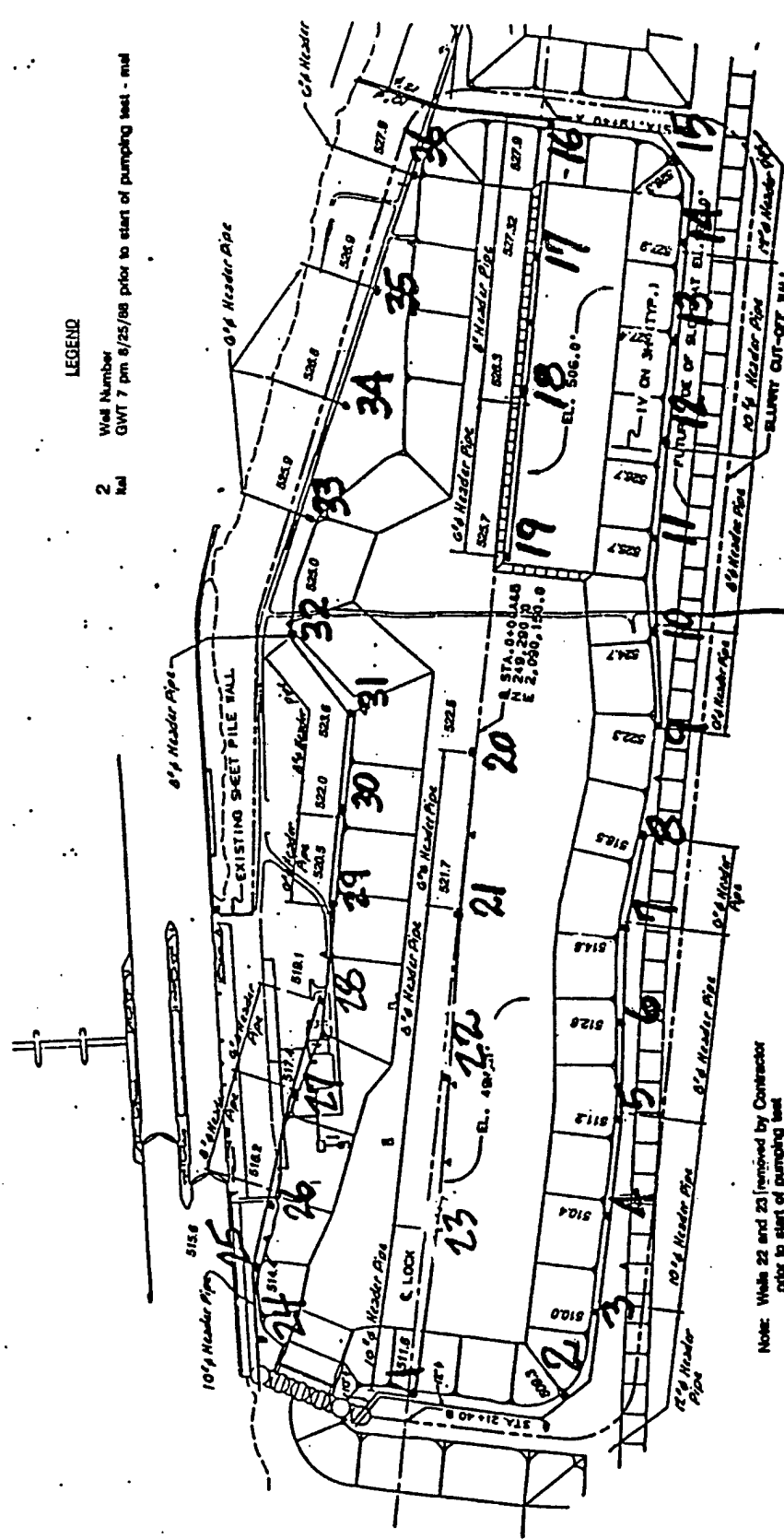
CM:ab



Piezometer number	GW1 6-16-88 prior to closure of cutoff wall - ml	GW7 7 pm 8/25/88 prior to start of pumping test - ml	GW2 25 Oct 1988 after 83.5 days of (effective) pumping
1	10	10	10
2	10	10	10
3	10	10	10
4	10	10	10
5	10	10	10
6	10	10	10
7	10	10	10
8	10	10	10
9	10	10	10
10	10	10	10
11	10	10	10
12	10	10	10
13	10	10	10
14	10	10	10
15	10	10	10
16	10	10	10
17	10	10	10
18	10	10	10
19	10	10	10
20	10	10	10
21	10	10	10
22	10	10	10
23	10	10	10
24	10	10	10
25	10	10	10
26	10	10	10
27	10	10	10
28	10	10	10
29	10	10	10
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31	10	10	10
32	10	10	10
33	10	10	10
34	10	10	10
35	10	10	10
36	10	10	10
37	10	10	10
38	10	10	10
39	10	10	10
40	10	10	10
41	10	10	10
42	10	10	10
43	10	10	10
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88	10	10	10
89	10	10	10
90	10	10	10
91	10	10	10
92	10	10	10
93	10	10	10
94	10	10	10
95	10	10	10
96	10	10	10
97	10	10	10
98	10	10	10
99	10	10	10
100	10	10	10

## LEGEND

PLATE 1

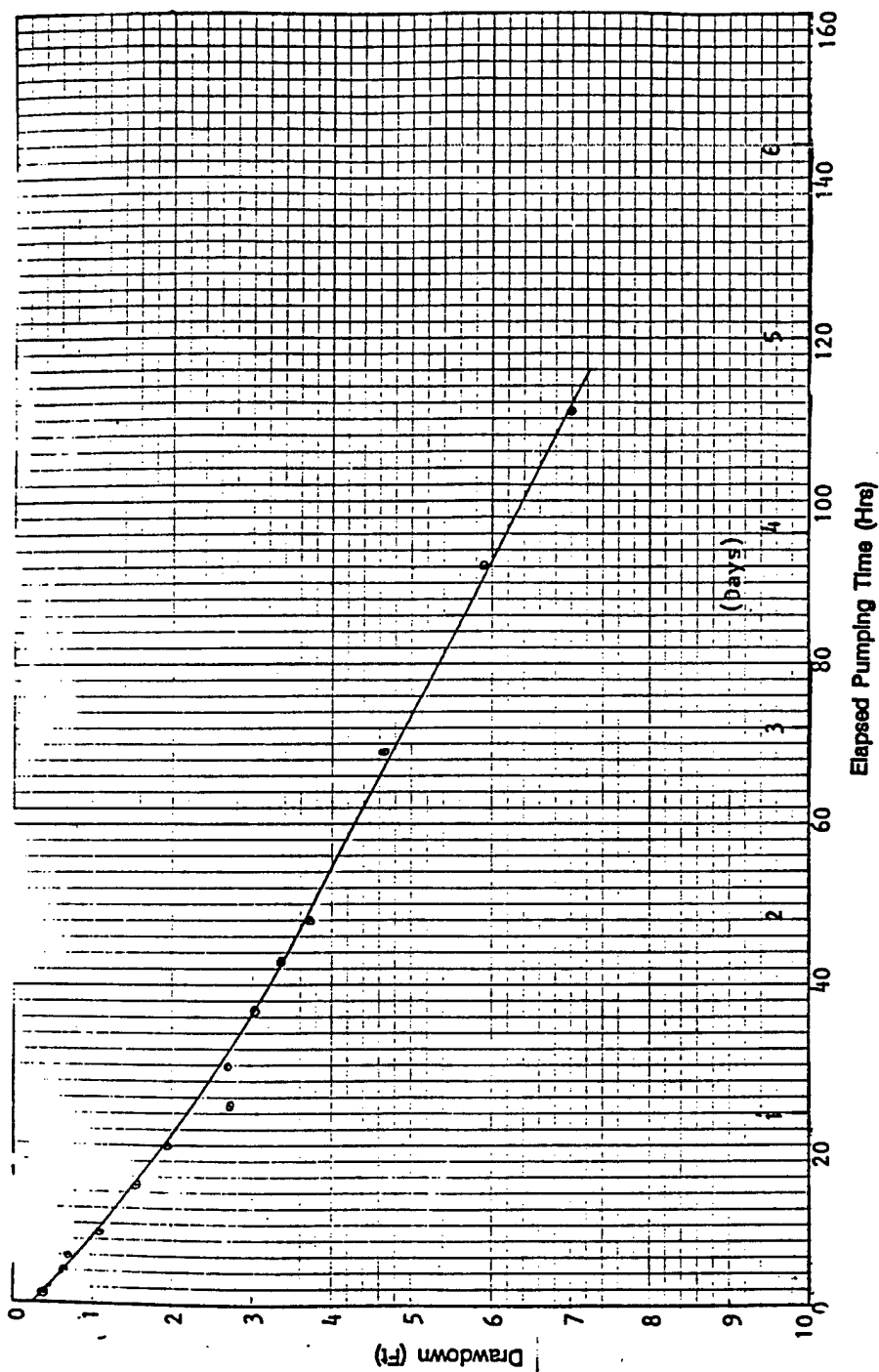


LEGEND

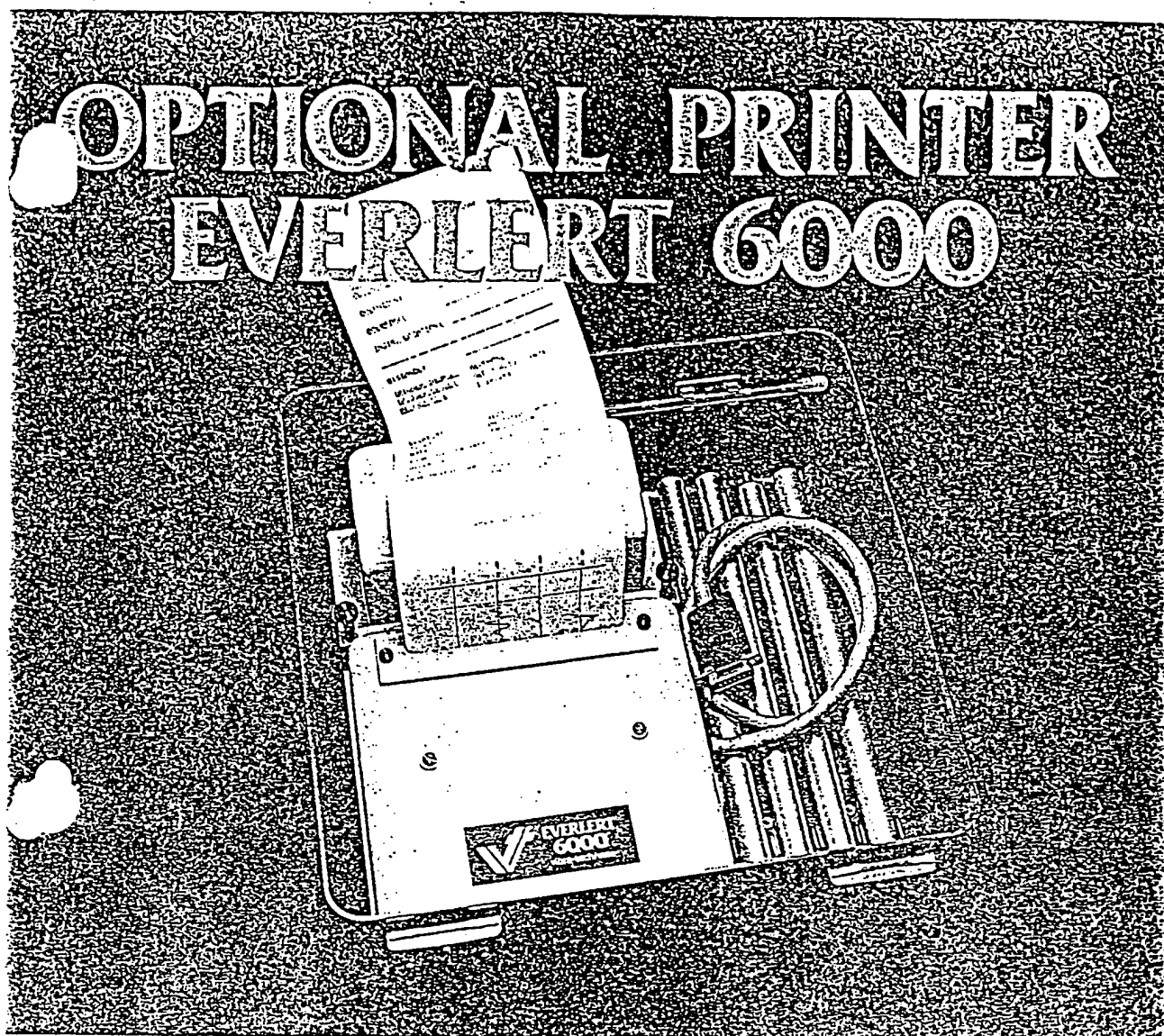
- 2 Well Number
- had GWT 7 pm 8/25/88 prior to start of pumping test - mud

Note: Wells 22 and 23 furnished by Contractor prior to start of pumping test

Gallipolis Lock  
GROUNDWATER TABLE IN WELLS  
PRIOR TO START OF PUMPING TEST - MSL.



Gallipolis Lock  
AVERAGE GROUNDWATER LOWERING  
vs  
ELAPSED TEST PUMPING TIME



## INSTANT ON-SITE RECORD AND RESULTS

- **Versatile** — may be carried into field inside Everlert 6000 carrying case or kept in office for later use.
  - **High Quality Printout** — of information from DATA MODULE. High resolution printer/plotter uses inexpensive and readily available supplies.
  - **Full Analog Waveform** — includes peak values and dominant frequencies for each trace, and maximum resultant of all traces.
- Dominant Fourier Frequency Analysis** — provides valuable insight into the energy characteristics of the entire vibration wave.

**TOLL FREE USA 800-233-6181**

**TOLL FREE PA 800-582-6374**

Home Office: 1st & North Church Sts., Hazleton, PA 18201

CONSULTANTS TO THE MINING, QUARRYING, CONSTRUCTION AND EXPLOSIVE USING INDUSTRIES

**vibra-tech  
engineers, inc.**

Hazleton, PA	717	466-8821
Pittsburgh, PA	412	781-1111
Phila. Office, PA	215	381-1111
Denver, CO	303	733-1111
Peersville, TN	615	398-1111
Knoxville, TN	615	398-1111
Charlotte, NC	704	398-1111
Louisville, KY	502	398-1111
Abingdon, PA	717	398-1111
Chicago, IL	312	398-1111
Rockville, MD	301	398-1111
Atlanta, GA	404	398-1111
St. Louis, MO	314	398-1111
St. Louisville, PA	717	398-1111
San Marcos, TX	512	398-1111
Denver, CO	303	733-1111
Orlando, FL	407	398-1111

# Explosive Data

## *Drilling and Blasting*

### *Equipment*

- A) 3" Holes - Track Drill

### *Pattern.... Rectangular*

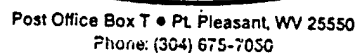
- A) Presplit..... 18 Inchs Center to Center
- B) General Rock Excavation.....5 Foot Center to Center
- C) Buffer Zone Center to Center

### *Explosives*

- 1) Brand Ireco
- 2) Type Iresplit, Unigel
- 3) Package Size
  - A) Unigel.... 2\*8" and 2\*16"
  - B) Iresplit 7/8\*24"
- 4) Accesories
  - A) Primers, E-Cord, Caps
- 5) Supplier
  - A) Ireco, Incorpation  
Independent Explosives CO.  
P.O. Box 3484  
Charleston WV.25334
- 6) Storage
  - A) Sheds located in isolated AREAS AROUND THE JOB SITE

# BLASTING

DATE	UNIGEL 2" X 8" by CASE	UNIGEL 2" X 16" by CASE	PRESPLIT 7/8" X 24" by CASE	E-CORD Feet	PRIMOS #5 #6 EACH	PRIMOS #7 #8 EACH	#245 PRIMOS SPACERS EACH	ADJEL LEAD LINE Feet	HITCAP H100CAP EACH		
1-13-89	20	60	20	4000	200 200	200 200	200 170	10,000	150 150		
1-27-89	60	184	34	20,000	600 N/A	600 600	N/A N/A	N/A	1200 300		
1-30-89	N/A	N/A	N/A	N/A	N/A 600	N/A N/A	N/A N/A	N/A	N/A N/A		
2-6-89	N/A	100	26	N/A	N/A N/A	N/A N/A	N/A N/A	N/A	N/A N/A		
2-8-89	80	N/A	10	N/A	300 300	200 200	N/A N/A	N/A	N/A N/A		
2-9-89	N/A	126	N/A	N/A	N/A N/A	N/A N/A	N/A N/A	N/A	N/A N/A		
2-13-89	N/A	200	N/A	N/A	300 300	200 200	N/A N/A	N/A	300 N/A		
2-28-89	41	200	10	12,000	600 300	200 200	N/A N/A	N/A	N/A N/A		
3-3-89	N/A	100	N/A	N/A	N/A N/A	N/A N/A	N/A N/A	N/A	300 N/A		
3-8-89	N/A	150	30	N/A	300 600	600 400	N/A N/A	N/A	N/A N/A		
3-15-89	N/A	N/A	N/A	N/A	600 600	200 800	N/A N/A	N/A	300 N/A		
3-18-89	10	130	20	N/A	N/A N/A	N/A N/A	N/A N/A	N/A	300 300		
3-20-89	N/A	N/A	N/A	8000	800 800	1400 N/A	N/A N/A	N/A	N/A N/A		
3-31-89	N/A	N/A	20	20,000	600 600	200 400	N/A N/A	N/A	N/A N/A		
4-14-89	40	100	10	20,000	N/A N/A	125 125	N/A N/A	25,000	300 N/A		
4-24-89	50	100	75	N/A	400 400	600 600	N/A N/A	N/A	600 N/A		
5-17-89	N/A	N/A	50	N/A	N/A N/A	125 125	N/A N/A	N/A	N/A N/A		
5-18-89	N/A	N/A	N/A	30,000	N/A N/A	N/A N/A	N/A 3400	N/A	N/A N/A		
5-24-89	N/A	100	N/A	N/A	N/A N/A	250 250	N/A N/A	N/A	300 150		
6-6-89	N/A	100	20	N/A	N/A N/A	200 400	N/A N/A	N/A	N/A N/A		
6-14-89	10	200	35	N/A	300 300	200 200	N/A N/A	N/A	600 N/A		
6-22-89	N/A	N/A	N/A	4000	N/A N/A	N/A N/A	N/A N/A	20,000	N/A 150		
6-28-89	N/A	60	N/A	N/A	300 300	200 200	N/A N/A	N/A	N/A N/A		
7-10-89	N/A	100	10	4000	N/A N/A	N/A N/A	N/A N/A	N/A	300 N/A		
7-19-89	N/A	N/A	N/A	N/A	300 N/A	200 200	N/A N/A	N/A	300 150		
7-25-89	10	100	N/A	N/A	N/A N/A	N/A N/A	N/A N/A	20,000	N/A N/A		
8-5-89	N/A	50	N/A	N/A	300 300	200 200	N/A N/A	N/A	300 150		
TAL	321	2160	316	122000	5900 5900	5900 5300	200 3570	115000	5250 1735		



U.S. Corps of Engineers Contract No. DACW69-88-C-0001

No. H74-T- 89-914

Attention: Mr. Ronald Harris

**Gentlemen:**

**WE ARE SENDING YOU** ☒ **Herewith** ☐ **Under**  
separate cover the following items

- ☐ Plans                      ☐ Shop Drawings                      ☐ Purchase Order  
☐ Specifications           ☐ Samples                               ☐ Copy of letter  
☐ Tracings                   ☐ Catalogue Cuts                   ☒ Blasting Report  
☐ Prints                      ☐ Change Order                      ☐ \_\_\_\_\_

DATE	11/10/89	JOB NO.	H-74
RE: Blasting Report Shot No. 287			
FILE: Blasting			

[illegible]

**THESE ARE TRANSMITTED as checked below:**

- ☒ For approval  
☐ For your use  
☐ As requested  
☐ For review and comment  
☐ FOR BIDS DUE \_\_\_\_\_ 19\_\_\_\_
- ☐ Approved as submitted  
☐ Approved as noted  
☐ Returned for corrections  
☐ \_\_\_\_\_
- ☐ Submit \_\_\_\_\_ copies for distribution  
☐ Resubmit \_\_\_\_\_ copies for approval  
☐ Return \_\_\_\_\_ corrected prints  
☐ \_\_\_\_\_
- ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS Approved as designed DM: 11-13-89; 1020 hrs

**COPY TO**

**SIGNED:**

**JPS**

# PROJECT

SHOT NO. 287

CONTRACT NO. DACW69-88-0001		CONTRACTOR GLR CONSTR		STATION AND RANGE R-90 THRU R-92		WORK FEATURE PRODUCTION	
ROCK TYPE SANDSTONE / SILTSTONE		TOTAL POWDER LBS. 264.83		ROCK IN-PLACE C.Y. 711.85 CY		POWDER FACTOR 0.37 <sup>1</sup> / <sub>ky</sub>	
LOADING START		LOADING FINISH		TIME AND DATE FIRED		SIGNATURE	

WIND AND WEATHER			<p>SHOW: PLAN AND SECTION VIEWS; STATIONING AND DIMENSIONS; PATTERN, DELAYS, HOLE ANGLES, TYPICAL CHARGE, STEMMING, SUB-DRILL REPORT INDIVIDUAL HOLE LOADINGS ON BACK, IF REQUIRED.</p> <p>NOTES: 1) SHOT TO BE COVERED W/ 18" SAND. 2) HOLES TO BE PADDED W/ 6" SAND 3) LOAD HOLES ADJACENT TO Pre-Split Face w/ 1-2"x8" STK.</p>		
WATER IN HOLES					
STEMMING LIMESTONE CHIPS No. 8					
POWDER TYPE					

LBS.	
UNIGEL 2"x8"	
22 STKS.	25.33
UNIGEL 2"x16"	
104 STKS	239.50
TOTAL	264.83

HOLES	SIZE	DEPTH
96	3"	5'
30	3"	6'
60	3"	6'

CAPS	LENGTH	EACH
No. 5	20'	34
No. 6	20'	34
No. 7	30'	29
No. 8	30'	29
17ms.	12'	29
100ms.	30'	5

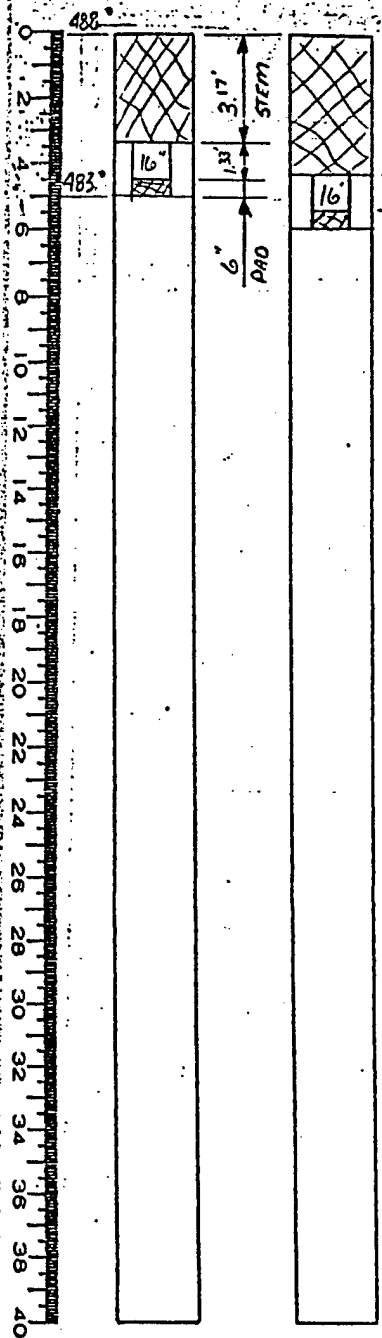
MAX. POUNDS/DELAY 4 HOLES = 8.41 #	
REMARKS, DAMAGE FLYROCK, EVALUATION	

LINE DRILL PAY ITEM => 29.5' x 2' : 59 SF

NPP FORM 3  
FEB, 76

## BLASTING REPORT

# TYPICAL LOADED HOLE



488.°

482.°

STA. 13+32A

R-90

R-91

575' 30.5' 575'

15' 15' 15'

15' 15' 15'

15' 15' 15'

15' 15' 15'

15' 15' 15'

15' 15' 15'

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15' 15' 15'

15' 15' 15'

15' 15' 15'

15' 15' 15'

15' 15' 15'

15' 15' 15'

15 SPACES @ 5' = 75'

STA. 14+07A

STA. 14+13A

R-92

STA. 14+43A

STA. 14+48A

± A-LINE

7.25' 20.6' 7.25'

= 12'

7.25' 20.6' 7.25'

= 12'

7.25' 20.6' 7.25'

= 12'

7.25' 20.6' 7.25'

= 12'

7.25' 20.6' 7.25'

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7.25' 20.6' 7.25'

= 12'

7.25' 20.6' 7.25'

= 12'

7.25' 20.6' 7.25'

= 12'

6'

5 SPACES @ 6' = 30'

5'

55.04

29.5'

60 LINE DRILLED HOLES  
6" SPACING @ 6' DEEP

PRODUCTION  
PRODUCTION OR OTHER

BURDEN 5' 6'

PACING 5' 6'

R-90 & R-91

R-92

Post Office Box T • Pt. Pleasant, WV 25550  
Phone: (304) 675-7050

U.S. Corps of Engineers Contract No. DACW69-88-C-0001

# LETTER OF TRANSMITTAL

TO U.S. Army Corps of Engineers  
Huntington District, P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald Harris

**Gentlemen:**

WE ARE SENDING YOU ☒ Herewith ☐ Under

**separate cover the following items**

- ☐ Plans                      ☐ Shop Drawings                      ☐ Purchase Order  
☐ Specifications           ☐ Samples                               ☐ Copy of letter  
☐ Tracings                   ☐ Catalogue Cuts                   ☒ Blasting report  
☐ Prints                      ☐ Change Order                      ☐ \_\_\_\_\_

DATE	11/9/89	JOB NO.	H-74
RE:	Blasting Report Shot No. 294		
FILE:	Blasting		

[illegible]

**THESE ARE TRANSMITTED as checked below:**

- ☒ For approval  
☐ For your use  
☐ As requested  
☐ For review and comment  
☐ FOR BIDS DUE \_\_\_\_\_ 19\_\_\_\_
- ☐ Approved as submitted  
☐ Approved as noted  
☐ Returned for corrections  
☐ \_\_\_\_\_
- ☐ Submit \_\_\_\_\_ copies for distribution  
☐ Resubmit \_\_\_\_\_ copies for approval  
☐ Return \_\_\_\_\_ corrected prints  
☐ \_\_\_\_\_
- ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS Approved as described above. 11-09-89 1440 hrs

**COPY TO**

**SIGNED:**

**JPS**

# PROJECT

SHOT NO. 294

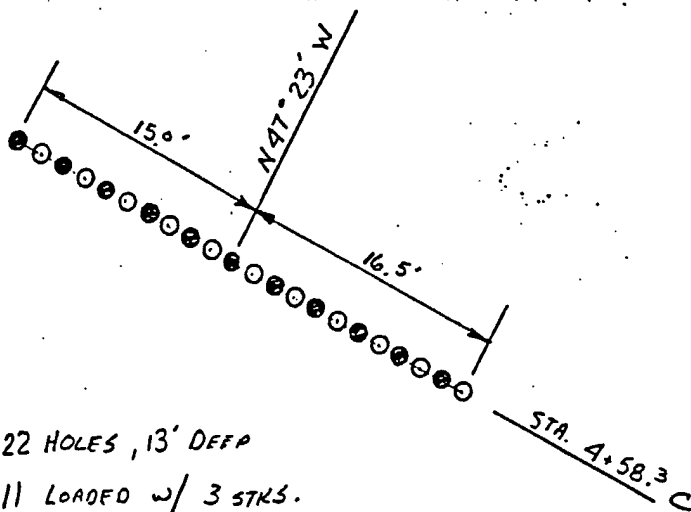
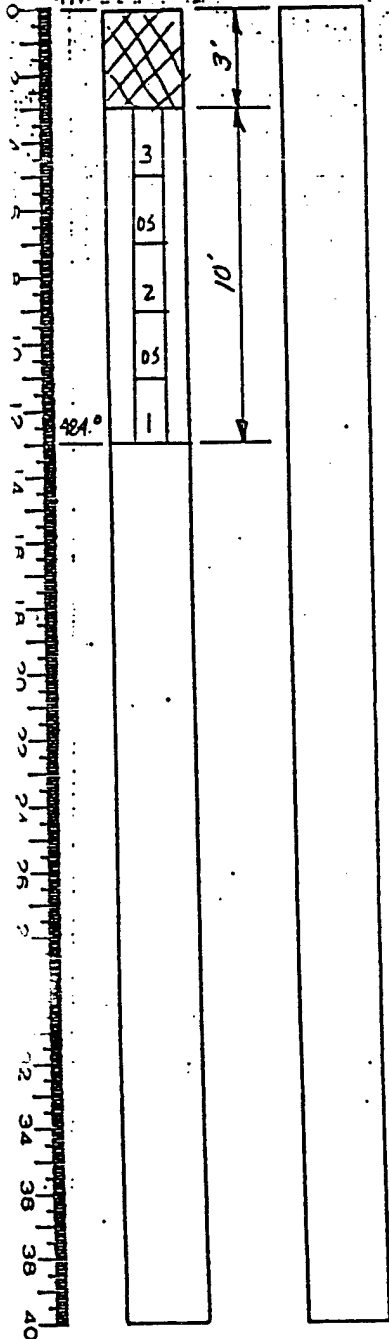
CONTRACT NO. DACW69-88-0001		CONTRACTOR GLR CONSTR		STATION AND RANGE RI-3		WORK FEATURE PRESPLIT	
ROCK TYPE SANDSTONE / SILTSTONE		TOTAL POWDER LBS. 16.32		ROCK IN-PLACE C.Y. 409.5 SF		POWDER FACTOR 0.04 */SF	
LOADING START		LOADING FINISH		TIME AND DATE FIRED		SIGNATURE	
WIND AND WEATHER				<p>SHOW: PLAN AND SECTION VIEWS; STATIONING AND DIMENSIONS; PATTERN, DELAYS, HOLE ANGLES, TYPICAL CHARGE, STEMMING, SUB-DRILL REPORT INDIVIDUAL HOLE LOADINGS ON BACK, IF REQUIRED.</p> <p>NOTE: 1) Cover w/ 18" SAND.</p> <p>SEE ATTACHMENTS FOR LAYOUT</p>			
WATER IN HOLES							
STEMMING LIMESTONE CHIPS NO. 8							
POWDER TYPE		LBS.					
PRESPLIT 0 7/8-29		33 STKS 16.32					
HOLES	SIZE	DEPTH					
22	3"	13'					
CAPS	LENGTH	EACH					
17ms.	12'	1					
ECORD	25yr.						
MAX. POUNDS/DELAY 16.32							
REMARKS, DAMAGE FLYROCK, EVALUATION							

NPP FORM 3  
FEB, 76

BLASTING REPORT

# TYPICAL LOADED HOLE

497°



PRESPLIT

PRODUCTION  
OR OTHER

JRDEN

\_\_\_\_\_

ACING

18"

\_\_\_\_\_

Post Office Box T • Pt. Pleasant, WV 25550  
Phone: (304) 675-7050

U.S. Corps of Engineers Contract No. DACW69-88-C-0001

# LETTER OF TRANSMITTAL

No. H74-T. 89-244

TO U.S. ARMY CORPS OF ENGINEERS

HUNTINGTON DISTRICT, P.O. BOX 9

APPLE GROVE, WV 25502-0009

**Attention: MR. RONALD C. HARRIS**

**Gentlemen:**

**WE ARE SENDING YOU** ☒ Herewith ☐ Under  
separate cover the following items

- ☐ Plans  
☐ Specifications  
☐ Tracings  
☐ Prints  
☐ Shop Drawings  
☐ Samples  
☐ Catalogue Cuts  
☐ Change Order  
☐ Purchase Order  
☐ Copy of letter  
☒ BLASTING REPORT  
☐ \_\_\_\_\_
- FILE: \_\_\_\_\_

DATE	03/24/89	JOB NO. H-74
RE:	VIBRATION MONITORING	
	SHOTS NO. 048A & 076	
FILE:	BLASTING	

[illegible]

**THESE ARE TRANSMITTED as checked below:**

- ☐ For approval  
☐ For your use  
☐ As requested  
☐ For review and comment  
☐ FOR BIDS DUE \_\_\_\_\_ 19\_\_\_\_
- ☐ Approved as submitted  
☐ Approved as noted  
☐ Returned for corrections  
☐ \_\_\_\_\_
- ☐ Submit \_\_\_\_\_ copies for distribution  
☐ Resubmit \_\_\_\_\_ copies for approval  
☐ Return \_\_\_\_\_ corrected prints  
☐ \_\_\_\_\_
- ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

**COPY TO**

**SIGNED:**

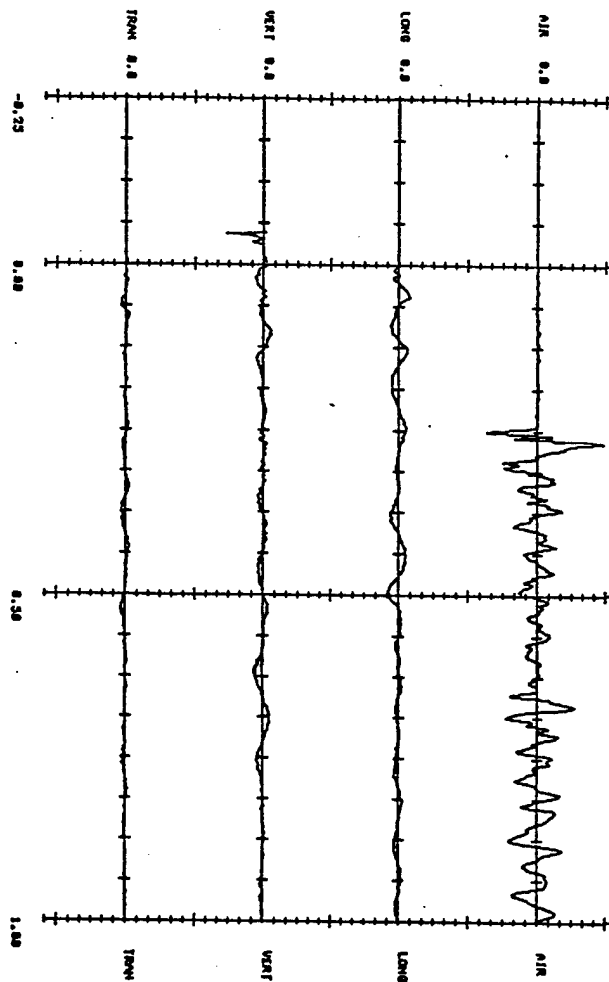
SIGNED: Larry P. Hanna, Jr.

LPH/1000

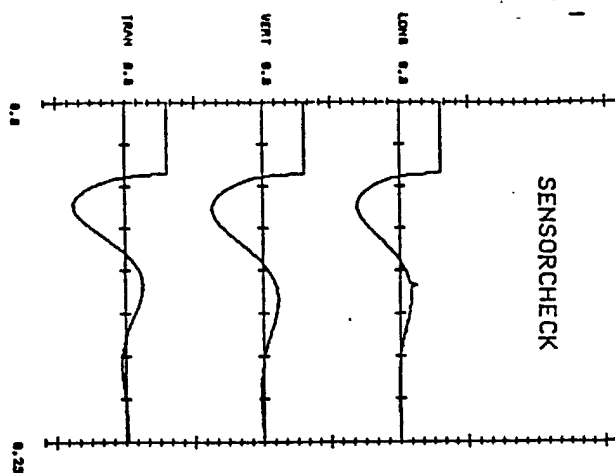
VIBRA-TECH EVERLERT 6000

0.29                      in/s  
-43                        ms

# EVENT WAVEFORM

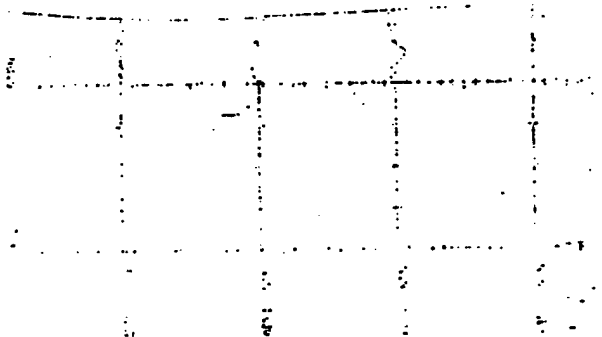


TIME SCALE: 0.0625 sec/div  
AMPLITUDE SCALE:  
 GEOPHONE : 0.087 in/sec/div  
 AIR : 0.00182 psi/div



TRAN	Cal Ok
VERT	Cal Ok
LONG	Cal Ok
AIR	Cal Ok

Calibrated on: Nov. 29,88  
 VIBRA-TECH  
 1st & North Church Sts.  
 Hazleton, PA 18201  
 PA 800-582-6374 USA 800-233-6181



END OF PAGE



**Ensign-Bickford**

**NONEL®**  
TECHNICAL BULLETIN  
**Primadets®**  
NOISELESS  
TRUNKLINE  
DELAYS (NTD)  
LONG LEAD  
HD NONEL®  
PRIMADETS®  
(LLHD)

BLASTING PRODUCTS DIVISION

**The**  
**Ensign-Bickford**  
**company**

**TOTAL NONELECTRIC  
SEQUENTIAL BLAST INITIATION  
FOR USE IN ALL SURFACE  
BLASTING APPLICATIONS**

**A NONELECTRIC DELAY SYSTEM  
SUITED FOR SURFACE COAL  
MINING, QUARRIES, OPEN PIT  
MINES AND CONSTRUCTION**

The Total Nonel® System serves as an excellent surface trunkline and down-line initiation system for the following reasons:

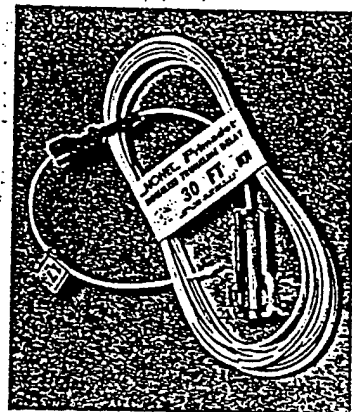
Safe Factory assembly of Nonel components is safer than field cutting and splicing of initiation components. Nonel tube can not be initiated by high frequency radio transmissions, static or stray electrical energy, flame, friction, or impact found in normal mining conditions. However, blasting caps are far more sensitive to these conditions.

Simple-Flexible Nonel components, both the NTD and the LLHD Nonel Primadets®, are factory assembled. They can be readily and simply connected to accommodate both basic and complex blast initiation patterns without complex circuitry.

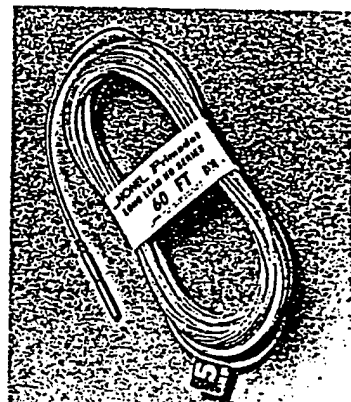
**Non-electric** Requires no knowledge of electric circuitry. Completely non-electric—no need to instruct blasters on intricacies of electric circuits. No need for elaborate training and retraining of blasters. This is the simplest system available for applications requiring unlimited sequential delays.

**Noiseless** The Nonel initiation system is quiet. The signal moving through an initiated tube is so quiet that it can be called Noiseless.

**Economical** The Nonel system allows for a reduced inventory resulting from the elimination of stocking various lengths of a complete delay series.



**NOISELESS TRUNKLINE DELAY**



**LONG LEAD H.D. NONEL  
PRIMADET**

# DESCRIPTION OF SYSTEM COMPONENTS

Nonel Primadets are nonelectric blasting caps using Nonel tube as a lead.

NTD units with Bunch Blocks and LLHD Nonels are Nonel Primadets whose lengths, delay times and hardware are suited for use as trunklines and downlines to inhole delays for surface blasting. The NTD and LLHD units are factory assembled with 5 and 3 components respectfully.

## NOISELESS TRUNKLINE DELAYS WITH BUNCH BLOCKS

## LONG LEAD HD NONEL PRIMADETS

Both the NTD and LLHD Nonel Primadets incorporate the Nonel tube which transmits a noiseless initiation signal from the initiation end to the delay in the output end. Reactive material on the inside of the tube propagates at 6000 feet per second.

The blasting cap has an integral millisecond (MS) delay element which initiates LLHD downlines and outgoing NTD's.

The blasting cap has an integral millisecond delay element. The cap will initiate all commercially available cast boosters and other cap sensitive explosives.

A delay tag indicates the millisecond end to end delay time. The tag is located just below the water tight ultrasonic seal at the end of the Nonel tube.

The Bunch Block connector is made of durable plastic and is designed to hook up LLHD downlines and outgoing NTD's.

LLHD Nonel Primadets utilize the same Nonel tube used for NTD's, however they have an added amount of abrasion resistant plastic. Tensile strength is also increased by this additional plastic. The LLHD tube has adequate physical properties to be used in all mining environments.

"J" Hook\*, an inert moveable fitting at the initiation end of the NTD for quick reliable connection to Primacord downlines.

\*NOTE: The "J" Hook is used only when the NTD is to be initiated by Primacord®. See separate bulletin on Noiseless Trunkline Delays. Nonel will not initiate another Nonel Line through a "J" Hook.

### PRIMER ASSEMBLIES

In all cases the LLHD Nonel Primadet of appropriate delay period is inserted into a booster. Any cap sensitive booster can be used as the Nonel tube emits virtually no side energy. The primer on the top of the explosive column would be assembled as shown in Figure 1.

Cast boosters initiated with a blasting cap provide more energy from the end opposite the cap well due to the position of the cap and slight mass difference of the cast explosive on that end. The primer on the bottom of the column would be assembled as shown in Figure 2.

With a soft package booster, the Nonel lead can be half-hitched or taped around the cartridge with the Primadet inserted fully into the base of the booster (Figure 3).

When using paper cartridge boosters, it is best to tape the Nonel lead to the booster so if the assembly needs to be pulled from the hole, it will not hang up (Figure 4).

Figure 1

Long Lead HD/  
Cast Booster  
Assembly

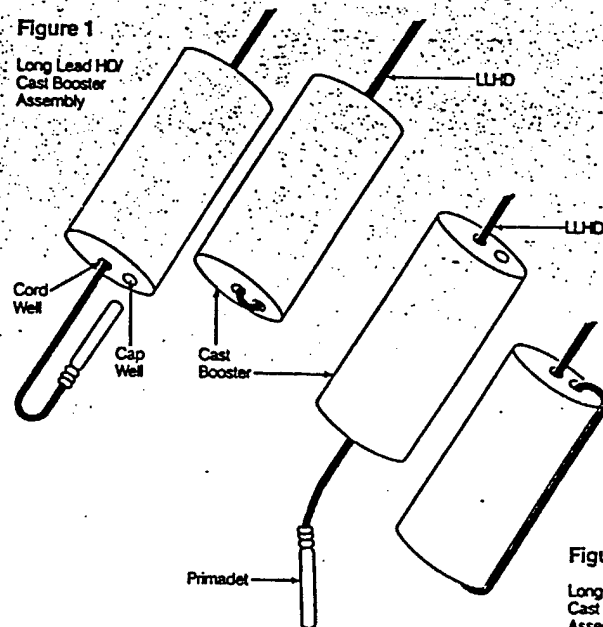


Figure 2 (Special Case)

Long Lead HD/  
Cast Booster  
Assembly

Figure 3

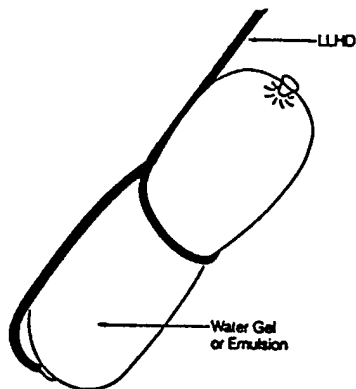
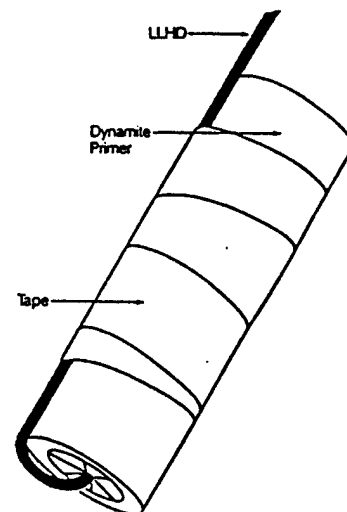


Figure 4



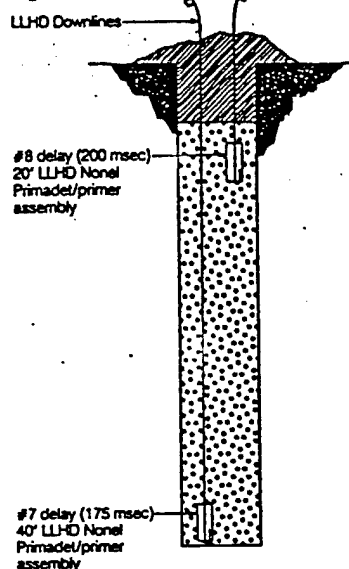
## LOADING PROCEDURES

### SOLID COLUMN LOADED HOLES

1. An LLHD Nonel Primadet/primer assembly is lowered into the borehole and the end of the Nonel tube is secured at the collar.
2. Explosive material is loaded into the borehole.
3. A second LLHD primer assembly is lowered to the top of the explosive column.

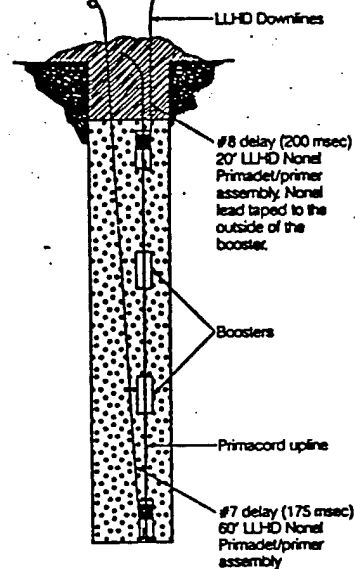
A Primacord upline may be used when loading wet bag material. Place the Nonel Primadet into the cap well of the primer; tape the Nonel tube to the outside of the primer; and run the upline through the primer as shown in Figure 6.

Figure 5



Lead lengths and delay times shown serve as examples.

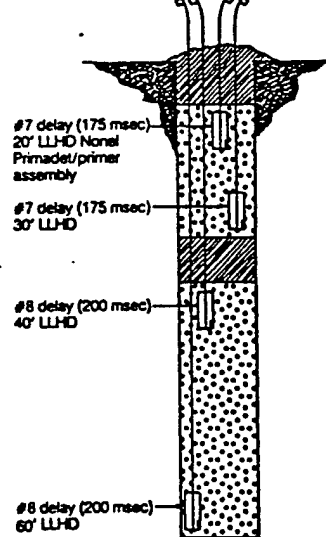
Figure 6



### DECK LOADED HOLES

1. An LLHD Nonel Primadet/primer assembly is lowered into the borehole and the end of the Nonel tube is secured at the collar.
2. The explosive material is loaded into the borehole.
3. If the bottom charge is to be double primed, then a second LLHD Nonel Primadet/primer assembly of the same delay is lowered to the top of the explosive charge.
4. Stemming material for decking is loaded.
5. The above procedure is then repeated until the appropriate amount of decks are completed.

Figure 7



## HOOKING UP THE SYSTEM

### DELAY JUNCTION

The system in its simplest form has one or two LLHD Nonel Primadets down the hole, and one incoming and one or two outgoing NTD's (Figure 8).

The two Nonel tube ends of the outgoing NTD's and the two LLHD Nonel tube ends are placed into the Bunch Block (Figure 10). After the four outgoing Nonel tubes have been placed against the blasting cap in the Bunch Block snap the lid of the block closed (Figure 11).

When the hook-up is complete, place the assembly on the ground so the outgoing NTD tubes do not double back over or near the block. Cover the assembly with stemming material to minimize the noise from the blasting cap and to insure that the outgoing NTD tubes are not close enough to the Bunch Block to cause the tube to be damaged or cut off prior to initiation.

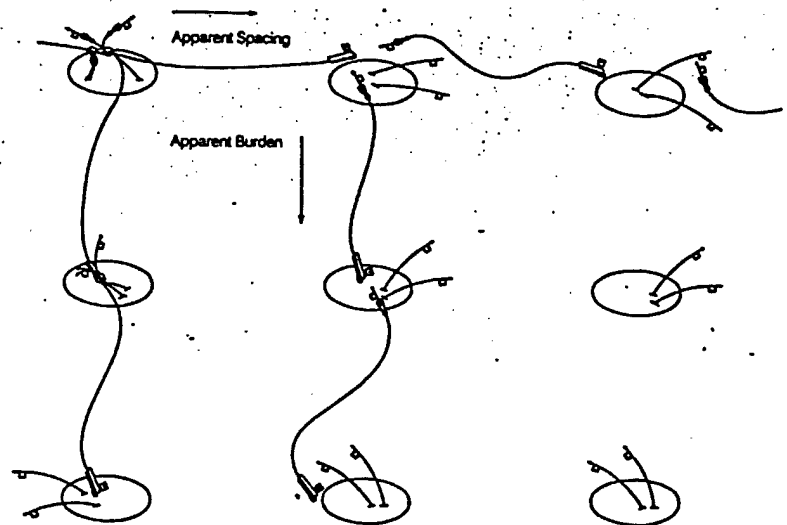


Figure 8 Blast pattern showing LLHD's and NTD's

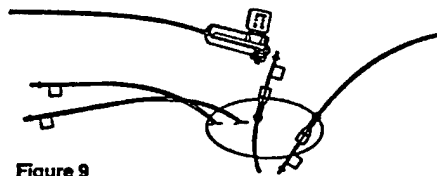


Figure 9  
Note: The "J" Hook has no function in an all Nonel hook-up.

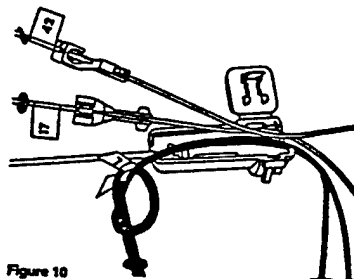


Figure 10

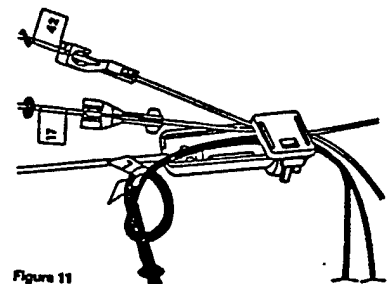


Figure 11

## APPLICATIONS—DELAY PATTERNS

The Nonel System is best suited for those applications which require more delay intervals due to vibration limitations and cannot have detonating cord trunklines because of overpressure (air blast) restrictions. It is common to design blasts requiring 100 or more separate charges to be detonated with no less than 8 milliseconds between the charges. LLHD Nonel Primadets provide an unlimited number of constant, precise delay intervals when used with Nonel NTD's.

## SEPARATE CHARGE FIRING—SAME DELAY EACH HOLE

A blast consisting of a single charge per hole normally has the same LLHD Nonel Primadet delay period in every hole. In some cases, the next higher delay period may be placed at the top of the column charge. Surface delay combinations of MS42 or MS25 and MS17 NTD's as shown by Figures 12 and 13 provide for two important functions:

1. The actual detonation time of the blasthole is greater than the surface activation time. Therefore, the risk of cutoff downlines or trunklines due to ground movement is minimized.
2. Blastholes detonate with a minimum of an 8 millisecond interval. An unlimited number of delays can be created with the proper selection of surface delay times and patterns.

## VIBRATION CONTROL

In Figure 15 an echelon pattern is shown using 100MS NTD's across the front with 17MS on a diagonal. There are 4 decks shown per hole without duplicating inside 8 milliseconds for 3 rows. Up to 8 decks can be fired maintaining 8 millisecond minimum interval in a Three Row Pattern. To determine the surface delay across the front to accommodate a specific number of deck charges simply multiply the desired number of decks times 25MS.

For example: six separate charged decks would require  $6 \times 25\text{MS}$  or 150MS minimum across the front. Always use 17MS NTD's straight back or on the diagonal (Figure 15).

Figure 12 Single Row—One hole per delay



Figure 13 Multiple Row—One hole per delay

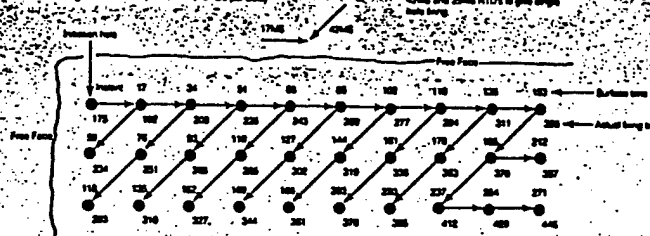


Figure 14

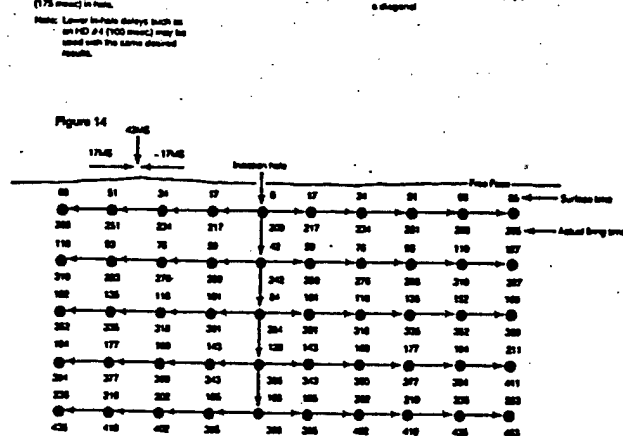
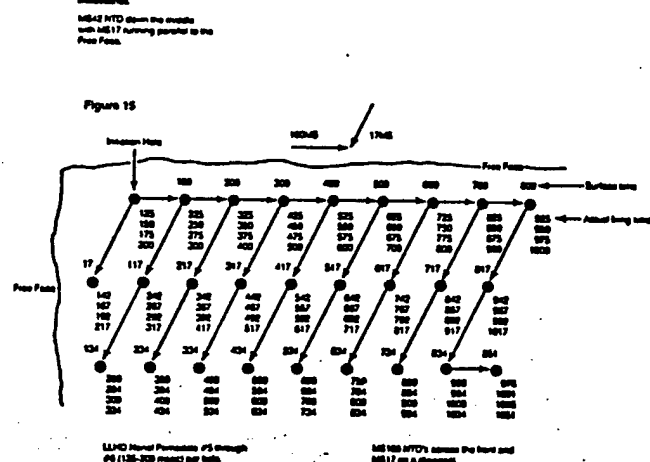


Figure 15



# DELAY TIMES AND PACKAGING

## LONG LEAD HD NONEL PRIMADETS DELAY TIMES AVAILABLE

LLHD Period	Time (milliseconds)
1	25
2	50
3	75
4	100
5	125
6	150
7	175
8	200
9	250
10	300
11	350
12	400
13	450
14	500
15	600

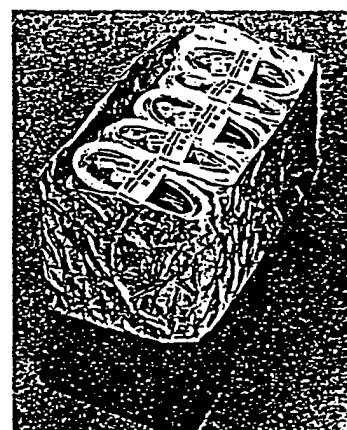
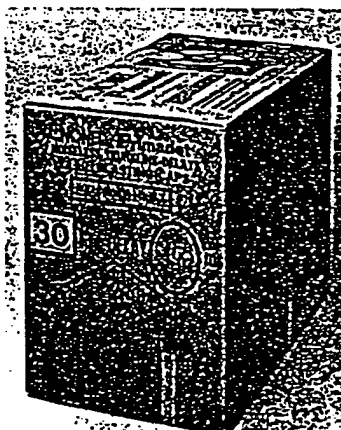
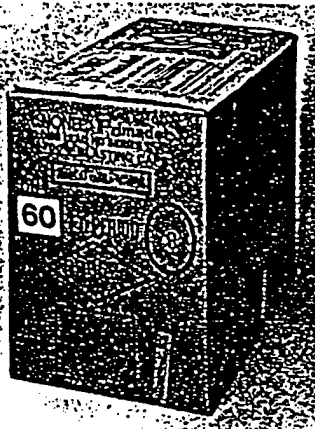
## PACKAGING

Length (ft.)	Units/case	Weight/case (lbs.)
20	200	39
30	150	41
40	125	44
50	100	47
60	100	49
Case dimensions 24" x 17" x 12"		
80"	50	41
100"	50	46
120"	50	52
Case dimensions 22½" x 10" x 20"		
*Each unit comes on a 4" x 3" spool.		

## NOISELESS TRUNKLINE DELAYS

### DELAY TIMES AVAILABLE

Time (milliseconds)	Length (ft.)	Bunch Block Color
Instant	12-20	Black
5	30-40	Black
9	50-60	Black
17	12-20-30-40-50-60	Green
25	12-20-30-40-50-60	Yellow
42	12-20-30-40-50-60	Red
100	30-50-60	White
200	50	Black
		Black



## PACKAGING

Length (ft.)	Units/case	Weight/case (lbs.)
12	300	60
20	150	29
30	150	34
40	125	34
50	100	32
60	100	34

Case dimensions 24" x 17" x 12"

#### IMPORTANT INSTRUCTIONS

Use only factory assembled units.  
Do not attempt to field splice Nonel or knot different lengths of Nonel tube together.

Never splice Nonel tube to Nonel tube as it will not initiate itself. Do not trim ultrasonic seals from the tube since the entrance of moisture into the tube may cause misfires.

Never drive any vehicles over Nonel tube. Rupturing or damaging the tube may also cause misfires.

#### INITIATING THE NOISELESS TRUNKLINE SYSTEM

The primary initiating devices for the trunkline are (1) Nonel Noiseless Lead-in Lines, (2) electric blasting caps, and (3) cap and safety fuse assemblies. Never attach a blasting cap for the purpose of initiating a blast until everything and everybody are in a safe area.

Make the primary initiating device attachment the very last step in readying the blast. Attachment of the primary initiating device should be made to the first hole to fire in the blast. This hole fires which in turn fires outgoing noiseless trunklines.

#### DISCLAIMERS

##### ATTENTION

The information and recommendations described in this bulletin cannot possibly cover every application of the product or variation of conditions under which the product is used. The recommendations herein are based on the manufacturer's experiences, research, and testing. They are believed to be accurate, but no warranties are made, expressed or implied. Also, the specifications contained herein are all nominals which represent our current production. The product described may be subject to change. Please feel free to contact the Ensign-Bickford Company for verifications.

##### NO WARRANTIES OR LIABILITIES

The product described herein is sold "as is" and without any warranty or guarantee, express or implied, arising by law or otherwise, including without limitation any warranty of merchantability or fitness for any purpose. Buyer and user agree further to release and discharge seller from any and all liabilities whatsoever arising out of the purchase or use of any product described herein whether or not such liability is occasioned by seller's negligence or based upon strict products liability or upon principles of indemnity or contribution.

Nonel Primadets are manufactured under U.S. Patent #3,590,739, U.S. Patent #3,125,024 and other patents pending.

The  
**Ensign-Bickford**  
company



Simsbury, Connecticut 06070

#### Ensign-Bickford Sales Offices:

660 Hopmeadow Street  
Simsbury, CT 06070  
203/658-4411

Post Office Box 97  
Louviers, CO 80131  
303/798-8625

5011 Washington Avenue  
Evansville, IN 47715  
812/476-1329

Post Office Box 322  
Wexford, PA 15090  
412/935-5712

5036 Snapfinger Woods Drive  
Decatur, GA 30035  
404/987-1000

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### LINE DRILLING

Line drilling will conform to section 2F-12.4 of the Contract Documents. Line drilling will be performed for all vertical faces against which concrete for sills, port deflectors and lateral walls will be placed and for all stepdown areas where adjacent foundation surfaces for concrete structures are at different elevations.

### GENERAL DESIGN

Bore hole size: 3/8 inch  
Hole depth: Full depth to grade  
Spacing: 6 inch center to center

General line drilling techniques will adhere to the procedures set forth in the publication "Four Major Methods of Controlled Blasting" by the Dupont Company, Inc. This brochure is referenced in the Contract Documents and a copy is enclosed for your reference.



## LINE DRILLING

### Principle

Line Drilling involves a single row of closely spaced, unloaded, small-diameter holes along the neat excavation line. This provides a plane of weakness to which the primary blast can break. It also causes some of the shock waves created by the blast to be reflected which reduces shattering and stressing of a finished wall.

### Location

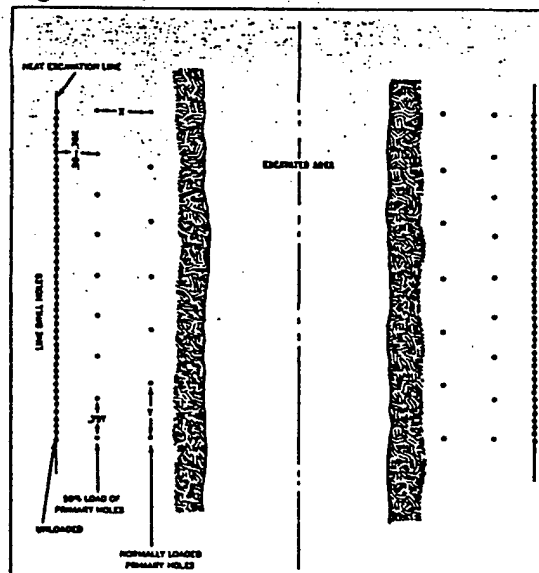
Line drill holes are generally 2 to 3" in diameter and are spaced from 2 to 4 times the hole diameter apart along the excavation line. Holes larger than 3" are seldom used in line drilling since the higher drilling costs cannot be offset by increased spacings.

The depth of line drill holes is dependent upon how accurately the alignment of the holes can be maintained. To get good results, the holes must be on the same plane; any wander or drift by attempting to drill too deep will have an adverse effect on results. For holes of 2 to 3" diameter, depths greater than 30 ft. are seldom satisfactory.

The blast holes directly adjacent to the line drill holes are generally loaded lighter and are more closely spaced than the other holes. The distance between the line drill holes and the directly adjacent blast holes is usually 50 to 75% of the normal burden. A common practice is to reduce the spacings of the adjacent blast holes the same amount with a 50% reduction in explosives load. The explosives should be well distributed in the hole using decks and Primacord\* downlines.

Best results with line drilling are obtained in homogeneous formations where bedding planes, joints and seams are at a minimum. These irregularities are natural planes of weakness that tend to note shear through the line drilled holes into finished wall. Therefore, thin-bedded sedimentary and more unconsolidated metamorphic formations are not well suited to line drilling for overbreak

Figure 1.



TYPICAL PATTERN AND PROCEDURE FOR LINE DRILLING

control unless drilling can be done perpendicular to the strike of the formation. This, however, is not practical in most excavation work.

**Open Work**—Figure 1 shows a typical pattern and procedure for line drilling in open work. Best results are obtained when the primary excavation is removed to within 1 to 3 rows of the neat excavation line. The last row or rows of holes are then slabbled away from the line drill holes using delay caps or "Primacord" Connectors. This procedure gives maximum relief in front of the finished wall, allowing the rock to move forward thus creating less back pressure which could cause overbreak beyond the line drilling.

\*Ensign Bickford registered trademark

In thin-bedded sedimentary and unconsolidated metamorphic formations, results with line drilling can usually be improved by light loading some of the line drill holes. This procedure led to the development of Cushion Blasting and Smooth Blasting. Also, it was found that line drilling results could be improved in some formations by light loading and firing the line drill holes in advance of the primary blast, and this led to the introduction of the technique known as Pre-Shearing or Pre-Splitting. These modifications of line drilling all promoted additional weakness along the neat excavation line by using explosive force to shear the rock between the holes.

**Underground Work**—The application of basic line drilling employing only unloaded holes is very limited in underground work. Generally closely spaced holes are employed but light loads are used. This is the technique we prefer to call Smooth Blasting and it will be described later.

#### Advantages

Line drilling is applicable in areas where even the light explosive loads associated with other controlled blasting techniques may cause damage beyond the excavation limit.

When used with other controlled blasting techniques, line drilling between the loaded holes promotes shearing to improve results.

#### Limitations

There are a number of limitations of line drilling which must be recognized.

- Line drilling is rather unpredictable except in the most homogeneous formations.

- Due to the close spacings required, drilling costs are high.

- Because line drilling requires a large number of holes on rather close spacings, drilling becomes tedious and results are often unsatisfactory due to poor hole alignment.

## IRESPLIT™ Perimeter Blasting Products

(IRESPLIT D was previously termed HERCOSPLIT WR; IRESPLIT S was previously termed IREMITÉ 60 continuous.)

IRESPLIT products are highly water-resistant explosives designed for open pit or underground blasting operations where precision overbreak control is desired. When used with presplitting or perimeter (smoothwall) blasting techniques, IRESPLIT produces straight-lined, smooth-faced walls in reasonably homogeneous rock formations.

### Advantages

**Product Variety.** IRECO offers both IRESPLIT S, a gelled slurry on a continuous spool, and IRESPLIT D, a semigelatin dynamite in 24-inch cartridges.

**Minimized Rock Overbreak.** Rock overbreak behind the IRESPLIT blastholes is minimized. Less extra unpaid-for excavation and extra concrete are required because excess backbreak is eliminated.

### Properties

Explosive Type	Density (g/cc)	Energy (cal/gm) (cal/cc)	Velocity (m/sec) (ft/sec)	Gap Sensitivity (inches)
IRESPLIT D Semigelatin Dynamite	0.95	960 915	2,700 8,860	12
IRESPLIT S Gelled Slurry	1.12	1,000 1,120	4,000 13,100	2

### Packaging

Diameter (inches)	IRESPLIT S		IRESPLIT D 24 inch Cartridge
	Continuous Spools (lbs/ft)	(ft/spool)	(lbs/ft)
7/8	—	—	0.31
1	0.39	128	0.38
1-1/8	0.53	95	—
1-1/4	0.60	84	—
1-1/2	0.86	58	—

<sup>1</sup> 1 inch, unconfined

<sup>2</sup> 1-1/4 inch, unconfined

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D-06B-08-87-2K

# IRECO Incorporated



## Priming and Loading

**IRESPLIT D.** The paper sleeve connector enables coupling of each IRESPLIT D cartridge into a continuous explosive. The column is lowered into the borehole by the detonating cord downline. The detonating cord is commonly half-hitched or taped tightly around the first cartridge in the borehole. At approximately six-foot intervals, the detonating cord should be secured to the column of explosive so it remains in close contact to ensure propagation of the entire column. IRESPLIT D can withstand 50 feet of water pressure up to nine hours.

**IRESPLIT S.** IRESPLIT S should be used at 10°F or higher and primed with a minimum 40 grain detonating cord secured to the entire length. Water depth is limited to 25 feet with IRESPLIT S.

## Transportation, Storage and Handling

IRESPLIT has a D.O.T. Classification of High Explosive, Class A.

Transport, store and handle IRESPLIT in compliance with federal, state and local laws.

## Product Disclaimer

IRECO disclaims any warranties with respect to this product, the safety or suitability thereof, or the results obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall IRECO be liable for special, consequential or incidental damages.

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**The Explosives Technology Company**

## RX and RX Plus Bulk Repumpable Emulsions and ANFO Blends

RX and RX Plus are Bulk Repumpable Emulsion Blasting Agents, which can be used straight or in combinations with up to 30% ANFO. The ANFO containing blends are manufactured in the IRECO RP trucks which have an 11,000 pound capacity tank for the Repumpable Emulsion and a 5,000 pound capacity for pre-mixed ANFO. The two ingredients are mixed, and pumped through a hose into the borehole. Quarrying and construction work are the principle applications for RX and RX Plus.

### Advantages

**Excellent Detonation Properties.** RX and RX Plus with ANFO blends offer a variety of detonation velocities, bulk strengths and all have high gas volumes which combine to give excellent results in nearly all rock formations.

**Bulk Explosives Storage.** The IREGEL REPUMPABLE BULK SYSTEM helps save time and money for mine operators, quarry operators and contractors because it alleviates many explosive storage and handling problems.

**Customer Operated.** RX and RX Plus are logical additions to operations with existing ANFO capabilities. IRECO will provide the equipment, training and technical support necessary to make the system easily operational by customers.

**High Loading Density.** RX and RX Plus Repumpable Explosives and ANFO blends have high borehole loading densities and complete borehole coupling, which result in improved fragmentation and pattern expansion.

### Properties

	Density (g/cc) (Average) (Maximum)	Energy (cal/gm) (cal/cc)	Weight Strength	Bulk Strength	Velocity (m/sec) (ft/sec)
RX	1.20	640	0.76	1.11	5,200
	1.25	770			17,100
RX with 20% ANFO	1.24	690	0.83	1.26	4,800
	1.28	855			15,800
RX with 30% ANFO	1.26	710	0.86	1.32	4,600
	1.30	900			15,100
RX Plus	1.20	750	0.90	1.32	5,200
	1.25	900			17,100
RX Plus with 20% ANFO	1.24	770	0.93	1.41	4,800
	1.28	955			15,800
RX Plus with 30% ANFO	1.26	780	0.94	1.45	4,600
	1.30	980			15,100

<sup>1</sup> ANFO = 1.00 at density of 0.82 g/cc.

<sup>2</sup> 4 inch diameter, unconfined.

The Explosives Technology Company

# IRECO Incorporated



## Characteristics

	RX	RX with 20% ANFO	RX with 30% ANFO	RX Plus	RX Plus with 20% ANFO	RX Plus with 30% ANFO
Minimum Borehole Diameter (inches)	3	3 1/4	4	3	3 1/4	4
Minimum Recommended Booster (cast)	5 oz.	12 oz.	12 oz.	5 oz.	12 oz.	12 oz.
Water Resistance	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent

Detonating Cord Downlines not Recommended

Double or multiple priming recommended in 20' or longer powder columns.

Generally recommended for open pit use however RX and RX Plus can be formulated for underground applications. Consult your IRECO representative.

## Transportation, Storage, and Handling

The RX and RX Plus emulsion component can be stored for one month at temperatures between 0°F and 90°F (-17°C and 32°C).

Transport, store and handle RX and RX Plus in compliance with Federal, state and local laws governing bulk Blasting Agents.

## Product Disclaimer

IRECO disclaims any warranties with respect to this product, the safety or suitability thereof, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall IRECO be liable for special, consequential or incidental damages or for anticipated profits.

The Explosives Technology Company

## Transportation, Storage and

**BLASTEX** can be stored for six months

Transport, store and handle all BE

# BLASTEX™

# Packaged Emulsion Blasting A

BLASTEX is a product line of economical blasting agents specifically formulated with packaged diameters as small as two inches. BLASTEX 100 and 120 are for surface use. BLASTEX 80 has an IME Class 1 Fume Rating for underground use.

## Advantages

**Firm Packages.** Firm packages provide easy handling and loading.

**Not a Class A Explosive. BLASTEX does not require Class A High Explosive.**

**Water Resistant.** BLASTEX has excellent water resistance, even when the pa

**Energy Levels.** BLASTEX has high velocity and pressure and comes in three e

## Properties

	Density (g/cc)	Energy (cal/gm) (cal/cc)	Weight Strength <sup>1</sup>	Ball Strength <sup>2</sup>
BLASTEX 80	1.20	705 845	0.80	1.10
BLASTEX 100	1.20	880 1,050	1.00	1.40
BLASTEX 120	1.20	1,055 1,270	1.20	1.70

The minimum recommended booster for all BLASTEX Emulsion Slurries is a 1/2 inch diameter, 100 lb. Detonating cord downline. Detonating cord downlines are not recommended in boreholes of less than 4 inches diameter. Dynamite is not recommended as a booster for BLASTEX.

## Packaging

Standard Sizes (Inches)	Plastic Tubing		Bag Diam. (Inches)
	Stick Weight (Pounds)	Stick Count (50 lb case)	
2 x 16	2.1	23	4
2 1/4 x 16	2.8	18	5
2 1/2 x 16	3.4	15	6
2 3/4 x 16	4.1	12	7
3 x 16	4.8	10	8

## Product Disclaimer

IRECO disclaims any warranties with re  
implied, INCLUDING WITHOUT LI  
PARTICULAR PURPOSE AND/OR AI  
from any and all injuries (including dei  
circumstances shall IRECO be liable for

<sup>1</sup> ANFO = 1.00 at density 0.82 g/cc<sup>2</sup> 3 inch diameter, unconfined

## The Explosives Technology Comp

# The

P.01A-08-87 3M

## IREMITE EMULSION Small Diameter Explosives

IREMITE EMULSION is a cap sensitive, packaged slurry explosive used in dry and wet boreholes. IREMITE 42, 62 and 82 are oxygen balanced for underground applications.

### Advantages

**Loading and Tamping.** The rigid consistency of IREMITE EMULSION permits easy handling and rapid loading. The products have good tamping characteristics which produce high borehole loading densities.

**Fumes.** Rapid re-entry into a blast site is permitted after an IREMITE EMULSION blast. The detonation products are low in noxious gases and smoke.

**Non-Headache.** The powder headache, which diminishes work efficiency by causing discomfort, is eliminated with IREMITE EMULSION.

**Water Resistance.** IREMITE EMULSION retains its design characteristics while in wet holes for long time-periods, even when the packages are broken.

**Low Temperature Sensitivity.** IREMITE EMULSION remains cap sensitive down to 10°F.

### Properties

	Density (g/cc)	Energy (cal/gm) (cal/cc)	Weight Strength <sup>1</sup>	Bulk Strength <sup>1</sup>	Gas Volume (moles/kg)	Velocity (m/sec) (ft/sec)	Fume Classification	Detonation Pressure (Kbars)
42	1.18	753 902	.90	1.30	39.0	5,200 17,050	IME-1	80
62	1.18	897 1,076	1.05	1.51	36.6	4,900 16,050	IME-1	71
82	1.18	1,000 1,200	1.17	1.68	35.0	4,700 15,400	IME-1	65
102	1.18	1,110 1,340	1.29	1.86	32.9	4,500 14,750	Open Pit Only	60

<sup>1</sup> ANFO = 1.00 at density 0.82 g/cc.

<sup>2</sup> 2 inch diameter, unconfined.

**The Explosives Technology Company**

# IRECO Incorporated



## Characteristics

Minimum Recommended Diameter	1-1/4 inches	
Minimum Recommended Booster and Temperature	10°F and up 0°F to 10°F -15° to 0°F	No. 8 cap No. 12 cap 9 gm booster
Detonating Cord Downlines not Recommended		
Maximum Hole Depth	100 feet 200 feet	No. 8 cap 9 gm booster

Under some extreme circumstances, such as close spacings and water saturated ground, these products may be susceptible to "dead pressing" effects. Consult an IRECO representative.

## Packaging

IREMITE EMULSION is available in the following sizes and counts		
Diameter x Length (inches)	Stick Weight (pounds)	Stick Count per case
1-1/2 x 16	1.16	42
2 x 16	2.03	24
2-1/2 x 16	3.40	15
2-3/4 x 16	4.10	12
3 x 16	4.63	10

## Transportation, Storage and Handling

IREMITE EMULSION has a D.O.T. classification of High Explosive Class A and can be stored for nine months between 0°F and 100°F (-17°C and 38°C).

Transport, store and handle IREMITE EMULSION in compliance with all federal, state and local laws.

IRECO disclaims any warranties with respect to this product, the safety or suitability thereof, or the results obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall IRECO be liable for special, consequential or incidental damages.

The Explosives Technology Company

## UNIGEL® Semigelatin Dynamite

UNIGEL is specifically developed for all-purpose blasting applications, including underground and surface mining. It replaces more expensive specialty-grade dynamites that offer varying energy values with each grade. UNIGEL has excellent uniformity of mixture and plasticity, will detonate completely under moderate water pressure, and is an excellent primer for ANFO.

### Advantages

**Universal Blasting Applications.** UNIGEL is a single explosive grade for universal blasting applications, which simplifies inventory requirements.

**Fumes.** Afterblast fumes and smoke are at a minimum.

**Cost-Saving.** UNIGEL provides excellent performance for less cost per cubic yard.

### Properties

Density (g/cc)	Energy (cal/gm) (cal/cc)	Weight Strength	Bulk Strength	Velocity (m/sec) (ft/sec)	Gap Sensitivity (inches)
1.27	1,000 1,270	1120	1186	4,900 16,100	12

### Characteristics

Minimum Recommended  
Booster

Water Resistance  
Sensitivity Restriction  
Fume Class

#6 Strength Detonator

Good  
Detonates with 2.4 grain cord  
IME 1

<sup>1</sup> ANFO = 1.00 at density 0.82 g/cc.

<sup>2</sup> 2 inch diameter, unconfined

The Explosives Technology Company

# IRECO Incorporated



## Packaging

UNIGEL Semigelatin Dynamite is available in the following cartridge sizes and counts.

Diameter x Length (inches)	Nominal Cartridge Count per 50 lb. Case
1 1/8 x 8	134-142
1 1/4 x 8	109-115
1 1/2 x 8	76-82
2 x 8	41-45
2 x 16	19-22
2 1/4 x 16	16-18
2 1/2 x 16	13-14
2 3/4 x 16	12-13
3 x 16	10
3 1/2 x 16	7
4 x 16	6
4 1/2 x 16 2/3	3
5 x 25	2

## Transportation, Storage and Handling

UNIGEL has a D.O.T. classification as a High Explosive Class A and can be stored for one year under cool, dry and well-ventilated storage conditions.

Transport, store and handle UNIGEL Semigelatin Dynamite in compliance with federal, state and local laws.

## Product Disclaimer

IRECO disclaims any warranties with respect to this product, the safety or suitability thereof, or the results obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall IRECO be liable for special, consequential or incidental damages.

---

**The Explosives Technology Company**

## IREMITE TX® Trenching Explosive

A new IRECO packaged emulsion especially designed for trenching and utility work.

### Advantages

#### Resistant to Dead Pressing

IREMITE TX can be used in boreholes as close together as 2.5 feet and shot with any delay sequence ranging from 25 milliseconds to several seconds without loss of sensitivity from detonation of charges in adjacent boreholes.

#### Non-Headache

The powder headache, which diminishes work efficiency by causing discomfort, is eliminated with IREMITE TX.

#### Water Resistance

IREMITE TX retains its design characteristics while in wet holes for long time period, even when the packages are broken.

#### Low Temperature Sensitivity

IREMITE TX remains cap sensitive down to 0°F.

### Properties

Density (g/cc)	Energy (cal/gm) (cal/cc)	Weight Strength <sup>1</sup>	Bulk Strength <sup>1</sup>	Gas Volume (moles/kg)	Velocity (m/sec) (ft/sec)
1.24	990	1.15	1.74	35.0	5,000
	1228				16,400

### Characteristics

Minimum Recommended Diameter

1-1/2 inches

Minimum Recommended Booster (0°F and up)

No. 8 cap

Det. Cord Not Recommended

(-15°F to 0°F)

9 gm booster

Maximum Hole Depth

100 feet with No. 8 Cap

Fume Classification

Open Pit Only

A continuous string of charges is necessary — use second cap if cartridge column is discontinued.

<sup>1</sup>ANFO = 1.00 at density 0.82 g/cc.

<sup>2</sup>2 inch diameter, unconfined.

**The Explosives Technology Company**

# IRECO Incorporated



## Packaging

IREMITE TX is available in the following sizes and counts		
Diameter x Length (inches)	Stick Weight (pounds)	Stick Count per case
1-1/2 x 16	1.2	41 to 43
2 x 16	2.1	23 to 25
2-1/2 x 16	3.4	16
2-3/4 x 16	4.1	12
3 x 16	4.9	10

## Transportation, Storage & Handling

IREMITE TX has a D.O.T. classification of High Explosive Class A and can be stored for nine months between 0°F and 100°F (-17°C and 38°C).

Transport, store and handle IREMITE TX in compliance with all federal, state and local laws.

## Product Disclaimer

IRECO disclaims any warranties with respect to this product, the safety or suitability thereof, or the results obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall IRECO be liable for special, consequential or incidental damages.

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The Explosives Technology Company

BLAST VIBRATION MONITORING

GJR Constructors will employ the services of the following company to aid in vibration monitoring during the blasting operations:

VIBRA-TECH ENGINEERS, INC.

115 ROLLING MEADOWS

SCOTT DEPOT, WV 25560

MR. MARK TRIMBLE JR.

VIBRA-TECH's resume of qualifications and a catalog cut of the Everlert Series 6000 Seismograph are presented on the pages that follow.

## RESUME OF QUALIFICATIONS

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SEISMIC CONSULTING  
GALLIPOLIS LOCK AND DAM  
DEPARTMENT OF THE ARMY  
HUNTINGTON DISTRICT, CORPS OF ENGINEERS  
GLR CONSTRUCTORS

### OVERVIEW OF VIBRA-TECH ENGINEERS, INC.

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Vibra-Tech Engineers, Inc. engages in consulting in the area of Liability Seismology. With eighteen offices nationwide, we have served the construction, quarry, mining, and other explosives using and seismic related industries throughout the United States, Canada, Central America, and the Caribbean.

### EXPERIENCE RECORD AND EXPERTISE

---

Since our beginning, the major endeavor of Vibra-Tech has been to serve as a liability protection organization to users of explosives and vibration producing equipment. We are the largest organization in the United States so dedicated. Vibra-Tech was an early pioneer in the continuing development and improvement of many of the techniques and most of the instrumentation presently used in the areas of loss control and liability seismology in conjunction with mining, quarrying, construction and demolition activities.

We provide liability protection primarily through five general categories of services.

1. Pre-Blast/Construction Surveys of buildings, wells and other structures, to document their condition. Vibra-Tech has conducted hundreds of thousands of these surveys.
2. The use of specialized portable seismographs and air effects recorders, much of which has been designed by and proprietary to Vibra-Tech. The data from these instruments are analyzed for comparison to recognized standards for structure protection.
3. Public relations efforts, either in the form of public meetings, or in conjunction with pre-blast/construction surveys. We consider our efforts in educating and assuring building owners that their properties will be protected to be a very important part of our loss-control program.
4. Damage claim Investigations, usually conducted on behalf of insurance carriers, to determine the validity of damages claimed by property owners.

5. Expert witness testimony during civil litigations involving alleged property damages. Vibra-Tech has participated in thousands of litigations in this capacity.

Other areas of expertise include:

Noise Surveys for the purpose of evaluating noise effects on individuals under varying conditions with respect to the source, receiver, and transmission medium.

Seismographic and Noise Equipment Design and Testing in conjunction with various major manufacturers.

Design of Vibration and Noise Specifications for construction projects under the direction of such organizations as the AEC, electric and water utilities, and major engineering and contracting firms.

Development of Vibration and Noise Legislation conjointly with the authorities of the states of Pennsylvania, Kentucky, Illinois, Indiana, West Virginia, Georgia, New Jersey, and Maryland.

Geophysical and Geohydrological Studies to determine geologic and ground water conditions in conjunction with construction, mining, and fill projects.

Blast Design Engineering to provide optimum blasting parameters for efficient rock excavation while minimizing deleterious effects.

Our services are explained further in the enclosed brochures.

A listing of our clients and/or projects with which we have been involved will be furnished upon request. A partial list can be found in the enclosed material.

#### PERSONNEL QUALIFICATIONS

-----

The following representatives of Vibra-Tech Engineers, Inc. will have responsibilities as required in conjunction with this project.

Mark R. Trimble, B.S. Geology, California University of Pennsylvania. Additional studies at Midland College and Permian Basin Graduate Center, both in Midland, Texas. Area Manager at Charleston, WV office and Geologist/Vibration Consultant. Since 1984, experienced in vibration recording and analysis, pre-job surveys, damage claim evaluation for structural and water supply claims, expert witness testimony. Prior to 1984 and since 1981, was Operation Engineer and Administrator for Western United States with Geophysical Service, Inc. Licensed and certified blaster in state of West Virginia. Certified instructor for West Virginia Blaster Certification Program. Memberships include: Society of Explosives Engineers, Association of Ground Water Scientists and Engineers, West Virginia Mining and Reclamation Association, Contractors Association of West Virginia.

Thomas W. Novotný, B.S. Geophysics, Bowling Green State University. Graduate Geophysical Studies, Pennsylvania State University. Licensed blaster - Commonwealth of Pennsylvania. Member of SME and AIME. Vice-President of Vibra-Tech Engineers, Inc. and Regional Manager at Pittsburgh, PA office. Previous experience in manufacture of electronic equipment for a major aerospace firm. Employed by Vibra-Tech Engineers, Inc. since 1970. Experience in recording and analysis of ground and air motion resulting from industrial sources, building inspections, damage claim investigations, expert witness, hydrogeologic studies and ground water quality analysis.

Anthony J. Petro, B.S. Electrical Engineering, Brown University, P.E. (Pennsylvania, New York, New Jersey, Massachusetts, Connecticut, Maryland, Illinois, Tennessee, Georgia, Kentucky, West Virginia, District of Columbia, And Florida). President of Vibra-Tech Engineers, Inc. Member of Blaster Advisory Committee, Commonwealth of Pennsylvania. Experienced in manufacture and use of electrical-electronic devices and measuring instruments. Employed by Vibra-Tech Engineers, Inc. since 1956. Experienced in vibration and sound measurement and blast effects.

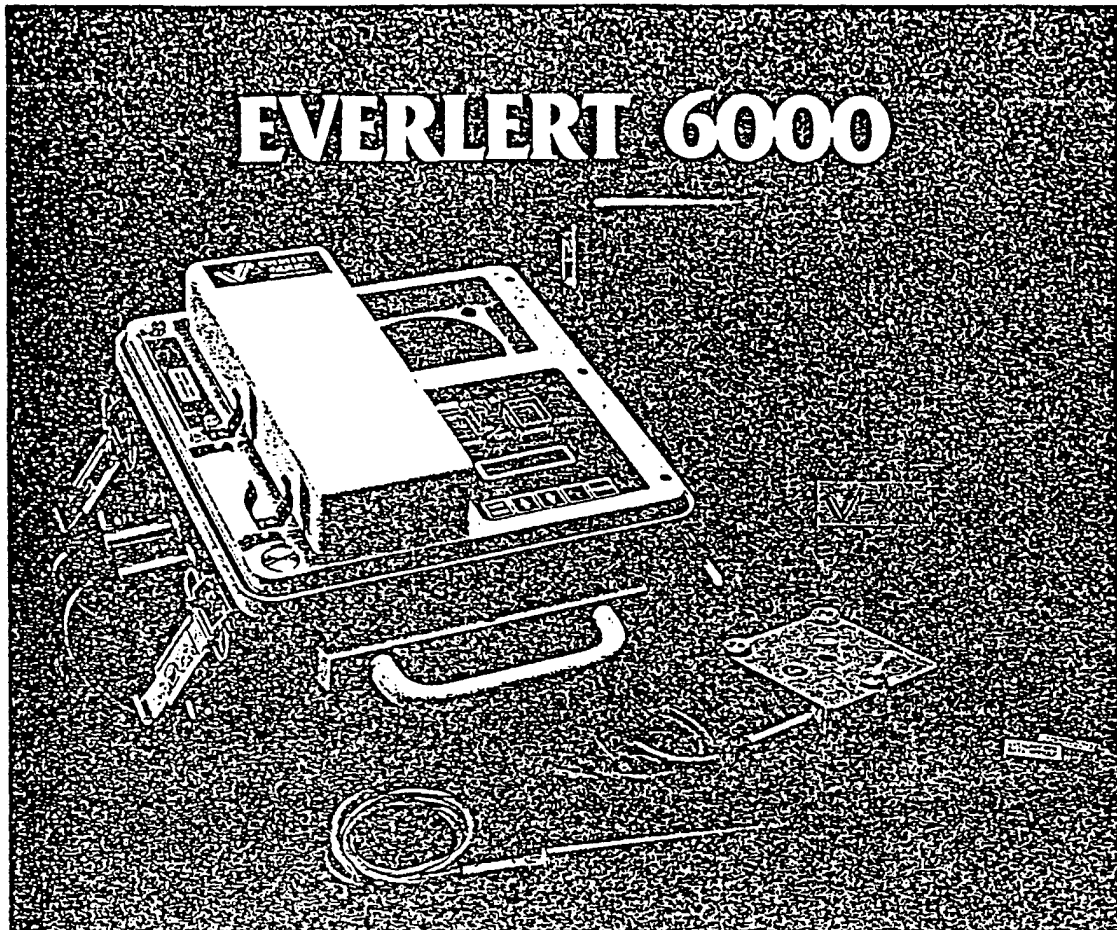
If other Vibra-Tech personnel are required to perform on this project at some time in the future, their resumes will be furnished upon request.

#### EQUIPMENT QUALIFICATIONS

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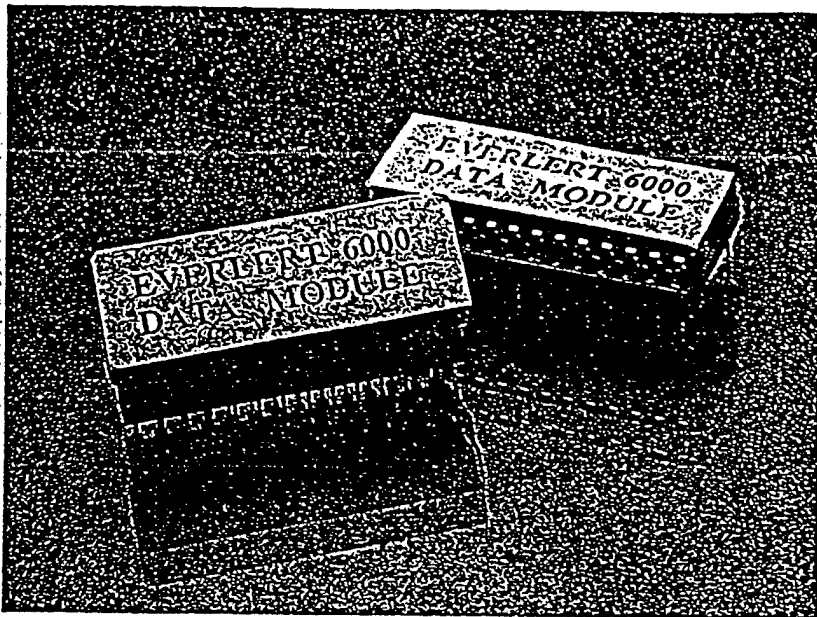
The equipment proposed for this project meets all requirements set forth in the specifications written by the Corps of Engineers. A complete description of the instrumentation is given in the enclosed literature.

# EVERLERT 6000



## A Digital Seismograph for Recording Ground Vibration and Air Concussion.

- Exclusive Plug-In Data Module provides tamper-proof, permanent storage of all data for legal credibility and liability protection.
- Complete Record Analysis available from DATA MODULES for Structural Response (RSVP) and complete frequency information.
- Low Cost Record Verification for compliance with regulations or specification requirements.
- Solid-State Components give maximum reliability under adverse field conditions.
- Simple Operation achieved with 2-buttons, a 4-key membrane and LCD step-by-step instructions.
- Unattended Operation provided by internal batteries and controllable triggering by seismic and/or air events.
- Automatic Calibration, Range Selection and Event Identification insure proper and accurate operation.
- Immediate Results Available from LCD readout, including recall of previous events recorded.
- Optional Built-In Printer Available for printing full analog waveform with peak values, dominant frequencies via Fourier analysis and maximum resultant values.



Exclusive solid state data module provides for permanent storage of complete ground vibration and air overpressure information.

#### PERFORMANCE

- Resolution
- Record Times
- Range
- Trigger Levels
- Frequency Range
- Blast Event Storage

0.00488 in/sec over entire range.  
 1 - 10 seconds.  
 Seismic Channels, Auto-ranging up to 10 in/sec.  
 Sound Channel, Auto-ranging up to 146 db.  
 Seismic Channels-Programmable up to 2.0 in/sec.  
 Sound Channel-Programmable up to 129 db.  
 2 to 250 HZ - Seismic and Sound.  
 Internal RAM - Up to 100 Typical Blast Events.  
 EPROM Chip - Up to 20 Typical Blast Events.

#### TECHNICAL

- Microprocessors
- A/D Converter
- Sampling Rate
- RAM
- ROM
- Interface
- Power
- Packaging
- Dimensions
- Weight

Intel 80186 at 8 MHZ.  
 8 bit pre-trigger and 12 bit post trigger.  
 4096 samples/sec per channel.  
 1/2 Meg.  
 16 K boot ROM  
 Serial RS232 interface.  
 8 volt DC with 9.5 amp-hour rechargeable battery.  
 Deep Drawn Aluminum case for rugged field use.  
 with regular lid 12" x 12" x 9 1/4".  
 with Printer lid 12" x 12" x 11 1/4".  
 with regular lid 35 lbs., with Printer lid 41 lbs.

#### vibra-tech engineers, inc.

Hazleton, PA	(717) 455-5861
Pittsburgh, PA	(412) 366-2773
Philadelphia, PA	(215) 696-1112
Abington, PA	(215) 572-8072
Atlanta, GA	(404) 972-8775
Delran, NJ	(609) 461-5166
St. Louis, MO	(314) 837-7182
Fl. Lauderdale, FL	(305) 437-0300
Rockville, MD	(301) 762-8175
Peekskill, NY	(914) 297-6305
San Marcos, TX	(512) 353-8069
Knoxville, TN	(615) 966-7483
Denver, CO	(303) 429-1996
Charlotte, NC	(704) 568-5561
Charleston, WV	(304) 757-7659
Louisville, KY	(502) 491-7201
Chicago, IL	(312) 437-0380
Budd Lake, NJ	(201) 691-4858

#### vibra-tech engineers, inc.

TOLL FREE USA 800-233-6181

TOLL FREE PA 800-582-6374

Consultants To The Mining, Quarrying, Construction and Explosive Using Industries

Home Office: 1st & North Church Sts., Hazleton, PA 18201

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Scope	Page 1
Monolith identification	Page 2 - 6
Drilling procedure	Page 7
Drilling log	Page 8
Anchor bar installation	Page 9 - 12
Calibration	Page 13 - 14

Product information

Williams Form Engineering	4 pgs
Dupont	11 pgs
Dayton Superior	2 pgs
Vendor Services	1 pg

### SCOPE

This procedure covers all operations in connection with the drilling, installation of resin cartridges, anchor bars and prestressing operations as specified by Contract Specification Section 20. The areas of work are limited to the four (4) miter gate sills, main lock up stream and down stream and auxiliary lock up stream and down stream at construction joint (CJ) elevation 488.0.

All procedure are based on the requirements of contract specifications, published product information and standard construction practices. Due to the inherent properties of the resin anchors, time and temperature factors are prime considerations.

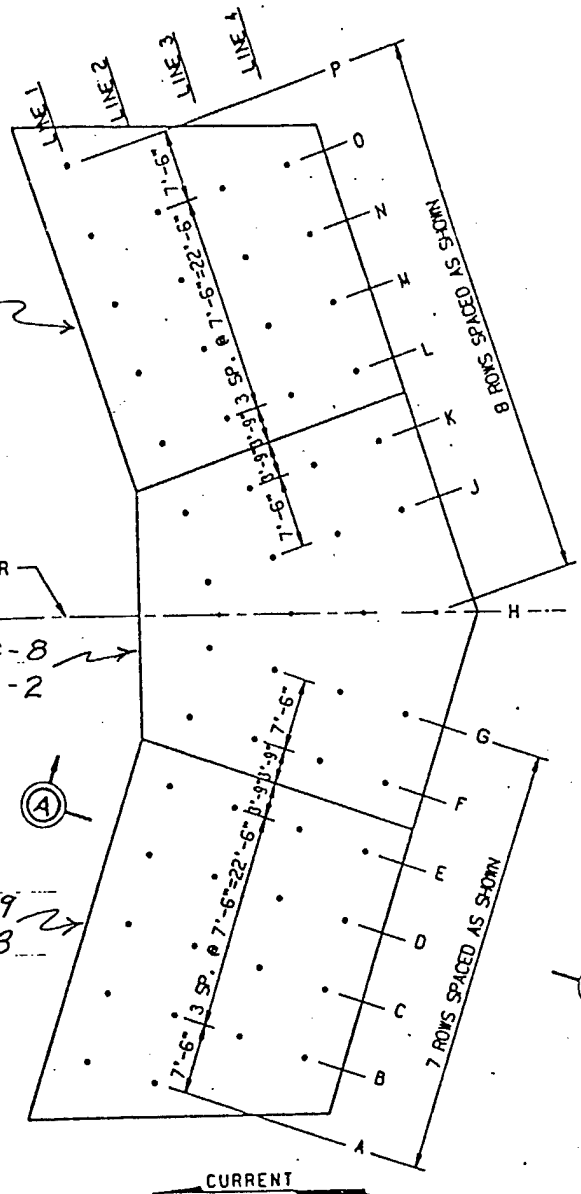
Unknown factors may include sub-surface defects such as voids, clay seams, flowing water, or unstable holes. Defects of this nature must be referred to the Corps of Engineers for their determination.

U/S MG-7  
D/S MG-1

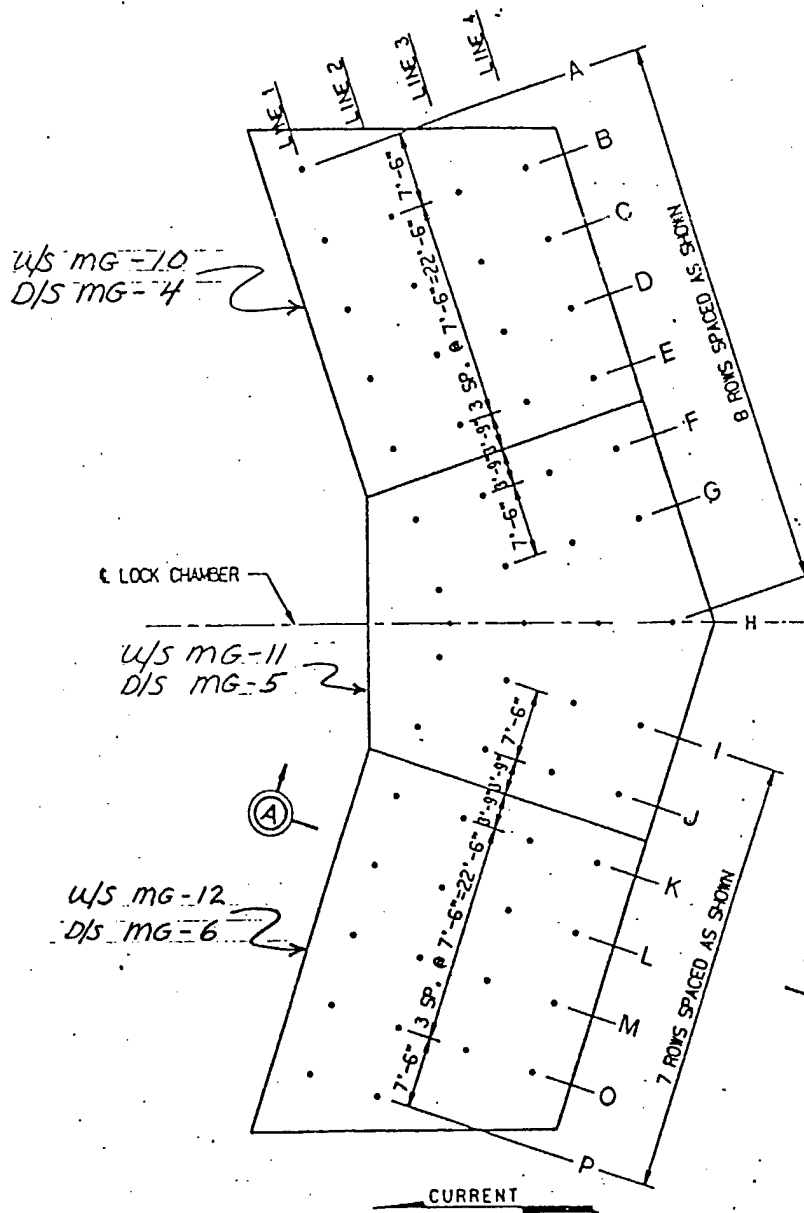
LOCK CHAMBER

U/S MG-8  
D/S MG-2

U/S MG-9  
D/S MG-3



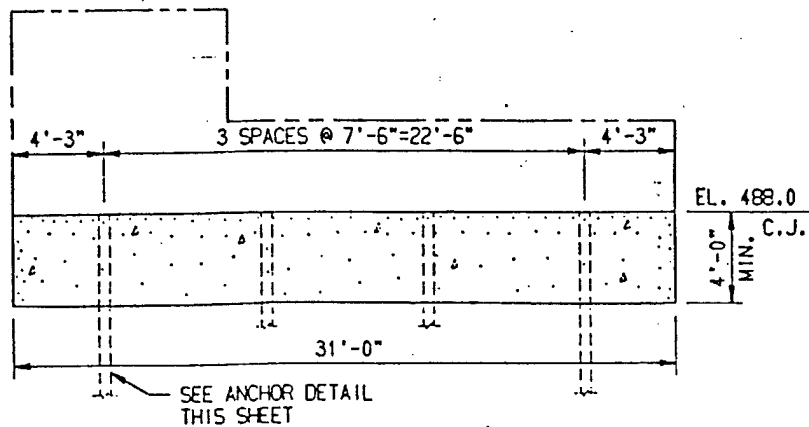
PLAN - MAIN LOCK



PLAN - AUXILIARY LOCK

## TENSIONING SEQUENCE

ROW LINE	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P
1	41	39	37	35	33	31	29	28	30	32	34	36	38	40	42
2	14	12	10	8	6	4	2	1	3	5	7	9	11	13	-
3	-	26	24	22	20	18	16	15	17	19	21	23	25	27	-
4	-	54	52	50	48	46	44	43	45	47	49	51	53	55	-



## SECTION A-A

# MITER GATE SILL ANCHORAGE

#### DRILLING PROCEDURES

Drilling equipment will be the same John Henry drill as used for blast hole drilling. Drill will be adapted by manufacture to accommodate 1 1/4 inch drill steel.

Drilling will be observed by GLR Q.C. personnel (see drilling log). Drill hole will be air blown clear with drilling equipment or separate air cleaning if required. Drill holes will be covered or plugged to prevent intrusion of foreign material into drill hole.

Any large irregularities in concrete surface (over 1/2 inch) shall be leveled with dry pack grout (Dayton Superior - sure grip high performance) minimum 24 hour cure prior to anchor installation.

# DRILLING LOG

FOR

ANCHOR BARS - PRESTRESSED

BI-165

Monolith I.D. \_\_\_\_\_

Date drilled \_\_\_\_\_

Drill hole

Line \_\_\_\_\_

Row \_\_\_\_\_

Drill Depth

Drill Time  
(+/- 0.5)

Material

Comments  
(See pg -)

0 - 4 ft

Conc

4 - 6

Rock

6 - 8

Rock

8 - 10

Rock

10 - 12

Rock

12 - 14

Rock

14 - 16

Rock

16 - 18

Rock

18 - 20

Rock

20 - 22

Rock

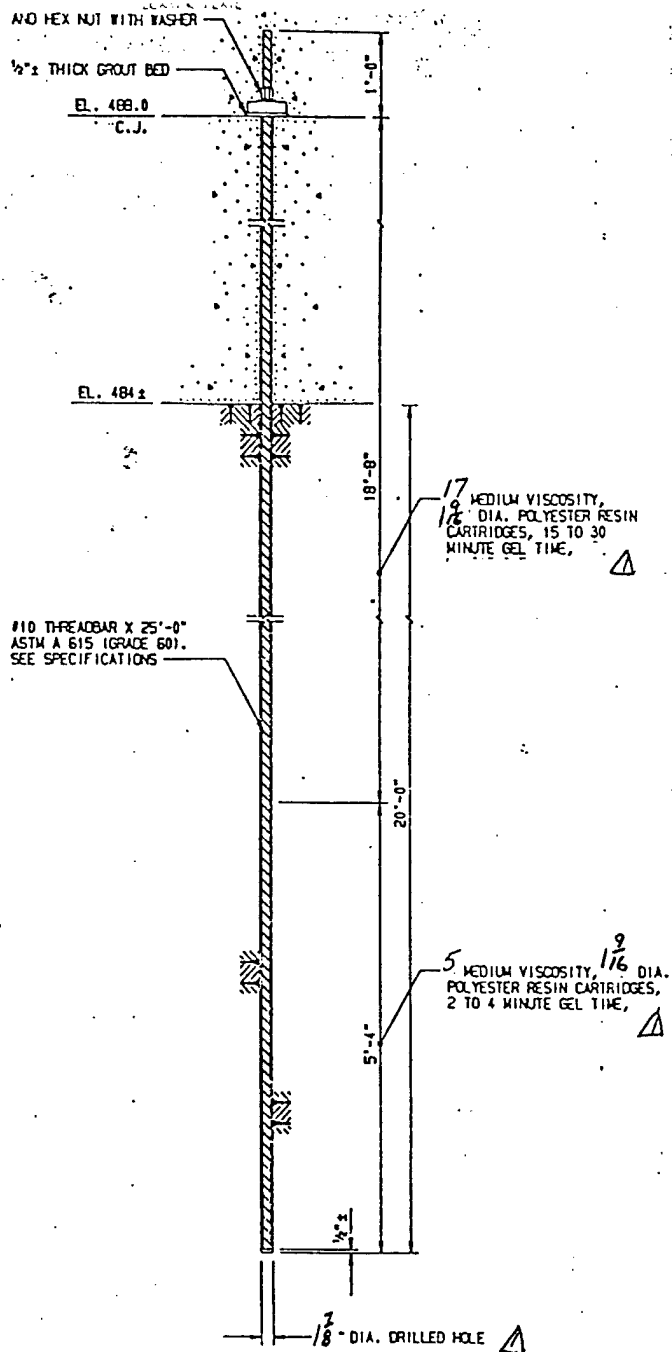
22 - 24

Rock

Over drill - \_\_\_\_\_ feet Reason \_\_\_\_\_

Drilled by: \_\_\_\_\_

GLR QC: \_\_\_\_\_



ANCHOR DETAIL Rev 1 10

### ANCHOR BAR INSTALLATION

Prior to anchor bar installation the drill hole will have been loaded with Faslok-T cartridges, base plate grouted in place and prestressing equipment will be ready for immediate use.

CAUTION - This operation will commence timed event shown by clock symbol

Elapsed time =        minutes

1. Chuck anchor rod with drive adaptor into drill, position over hole in plumb position "Untimed"
2. Feed anchor rod to top of Faslock-T cartridges "Untimed"
3. Rotate slowly and feed anchor bar through cartridges until full depth of 24 feet is reached. (Rotation Optional)

Elapsed time = 0-3 minutes

4. Rotate anchor bar rapidly:  
Rotary drill = 10-20 seconds  
Percussion drill = 40-60 revolutions

Elapsed time = 3-4 minutes

5. Remove drill and drive adaptor, install jacking extension, jack and related hardware.

Elapsed time = 7-8 minutes  
minimum to start

6. Load anchor bar to calibrated gauge value (33,000 lb minimum load on bolt), tighten nut on anchor bar until gauge pressure starts to drop (load transfer point). See page \_\_\_\_.

Elapsed time = 15-18 minutes  
maximum to complete

NOTE: Elapsed times based on cartridge temperature of 55 - 60 degrees Fahrenheit.

### LOADING FASLOC-T CARTRIDGES

Prior to cartridge installation, holes will have been inspected for conformance to required diameter, drill depth and any obstructions.

#### LOADING SEQUENCE

1. Fasloc-T color code "green"  
1 - 2 minute gel time  
5 required
2. Fasloc-T color code "blue"  
15 - 30 minute gel time  
17 required

Cartridge length = 12" standard length. Top of last cartridge will be approximately 3 feet below grade.

Verify 1st cartridge reaches bottom of drill hole prior to loading balance of cartridges.

Verify temperature of Fasloc-T cartridges prior to installation. See time/temp chart in Dupont brochure.

COMMENT TO

ANCHOR BAR PRESTRESSING

Start of applied prestressing load is dependant on bottom 1-2 minute cartridges developing strength within allotted time. Temperatures colder than 55 degrees Fahrenheit will increase the minimum time interval prior to starting prestressing load.

With all slack removed in jack arrangement subsequent jacking should result in increasing gauge pressures with no indication of relaxation. The maximum elongation of the anchor bar at full applied load will be approximately 0.21 to 0.24 inches.

Excessive movement other than normal elongation at top of anchor bar could indicate insufficient bond time for 1-2 minute cartridges or general failure of anchor bar.

CALIBRATION

Calibration of Contractor furnished jack(s) will be done by Corps of Engineers.

Calibration equipment (Contractor furnished)

Enerpac - Mini hydraulic load cell  
Model No. LM-2506  
50,000 lb capacity  
See catalog data

# MINI-HYDRAULIC LOAD CELLS

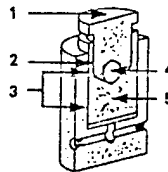
## Compression type — up to 300 tons

Used for accurate force measurement in:

- PRESSING • WEIGHING • TESTING
- PRODUCTION PROCESSES • QUALITY CONTROL

### EXCLUSIVE FEATURES:

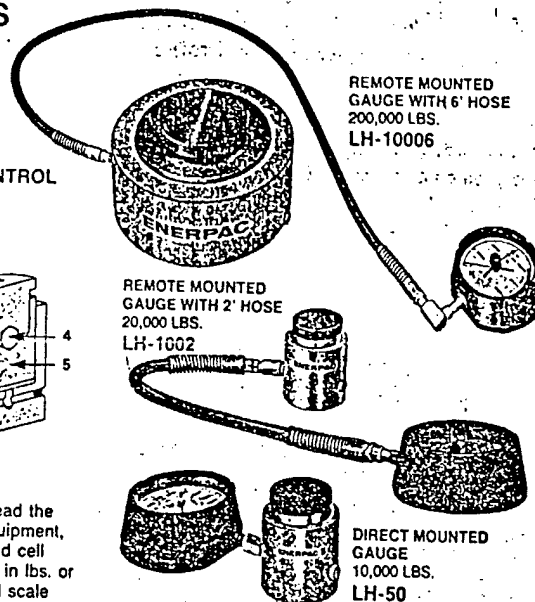
1. **SWIVEL LOADING PAD** — Aligns load with load cell — reduces eccentric loading for longer life.
2. **SELF-CENTERING O-RING** — Automatically self-levels the top pad when not loaded.
3. **PLUNGER RETAINER RING & BUNA-N TYPE SEALS** — for trouble-free performance under high compressive loads.
4. **UNIQUE LOAD PIVOT BALL** — Low position of swivel-type ball transmits the load to a lower point in the plunger — reduces side loading and friction.
5. **BRONZE PLATED PLUNGER** — Eliminates steel on steel contact for low friction.



These completely portable compression type load cells read the actual loads or forces being exerted on or within your equipment, your fixtures, or weight measurements. Just insert the load cell where force measurement is needed and read the gauge in lbs. or kg. of force. An economy tool—with accuracy to  $\pm 2\%$  full scale reading.

Gauges are calibrated for force readings and read in pounds and kilograms. Direct mounted gauges have a 4" face. Remote mounted gauges have a 4 1/2" face.

Gauges are equipped with a maximum indicating pointer to indicate the maximum pressure developed after a test is completed or to pre-select a desired pressure or load. Red pointer with plastic face plate cover follows regular gauge pointer as pressure increases, then remains at maximum reading when pressure cycle ends. Regular pointer returns to zero and maximum indicating point resets to zero for next test or run.

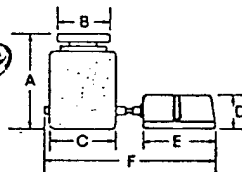


### VERSATILE AND LOW COST TEST SYSTEM

This manufacturer of disposable pens, lighters and shavers designed a test system which includes an LH-1002 Load Cell with its loading pad positioned within the opening of the bed of an A-310 Arbor Press Frame (page 68). An RR-1010 Double-Acting Cylinder (page 18) powered by a P-84 Hand Pump (pages 24-25) is mounted on the press frame to supply force to test samples while the load cell, with an accuracy of  $\pm 2\%$  full scale, measures this force. This system costs under \$2,100 and allows the lab to study design concepts, simulate and detect production problems and determine the design, manufacture and use of production assembly equipment.

## TENSION LOAD CELL

Five Ton Capacity



### FEATURES:

- Economical - Less costly than most other tension devices
- Nickel plated to reduce rust and corrosion
- Factory sealed for accuracy
- Stored in cushioned metal case

Used for tension measuring applications such as lift trucks, cranes, drawbars, pull tests, etc. Self-contained hydraulically operated units measure tension in 200 pound increments. Equipped with maximum indicating pointer for reading pre-selected pressures or loads. Accurate to  $\pm 2\%$  full scale. Includes hook and eye on either end for easy installation.

ORDER MODEL NO. TM-5

### SELECTION CHART

Type of Mounting	Capacity (Lbs.)	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	Two Bore Holes	Gauge Reading Increments	Minimum Reading	Model No.
Direct Load Cell Mounted	2,000	3 3/4	1 3/4	2 1/4	2 3/4	5 1/4	10 1/4	1/4-20	20 lbs.	100	LH-10
Remote Mounted	10,000	3 3/4	1 3/4	2 1/4	2 3/4	5 1/4	10 1/4	1/4-20	100 lbs.	500	LH-50
Remote Mounted with 2' Hose	2,000	3 3/4	1 3/4	2 1/4	2 3/4	5 1/4	33 3/4	1/4-20	20 lbs.	100	LH-1002
Remote Mounted with 2' Hose	10,000	3 3/4	1 3/4	2 1/4	2 3/4	5 1/4	33 3/4	1/4-20	100 lbs.	500	LH-502
Remote Mounted with 2' Hose	20,000	3 3/4	1 3/4	2 1/4	2 3/4	5 1/4	33 3/4	1/4-20	200 lbs.	1,000	LH-1002
Remote Mounted with 2' Hose	50,000	4	2 3/4	3 3/4	2 3/4	5 1/4	82 3/4	3/8-24	500 lbs.	3,500	LH-2506
Remote Mounted with 6' Hose	100,000	5 1/2	4	5	2 3/4	5 1/4	84 1/4	3/8-24	1,000 lbs.	5,000	LH-5006
Remote Mounted with 6' Hose	200,000	6 1/2	5	6 1/4	2 3/4	5 1/4	85 1/4	3/8-24	2,500 lbs.	10,000	LH-10006
Remote Mounted with 6' Hose	600,000	6 1/2	6	12 3/4	2 3/4	5 1/4	91 1/4	3/8-16	10,000 lbs.	10,000	LH-30006

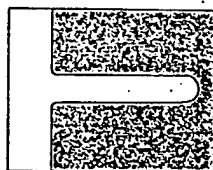
\* LH-30006 — Designed for regular continuous cycling at 300,000 pounds for rolling mill type applications to monitor roll pressures. Rated at 600,000 pounds for regular intermittent type usage applications.

Also read in kilograms.

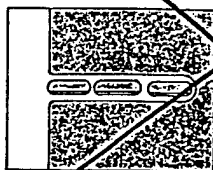
## S6R RESIN CARTRIDGES

Williams resin cartridges consists of two components (1) quality polyester resin and (2) its catalyst. These precisely measured quantities are separated by a thin plastic film and are enclosed by this same film. After holes are drilled, the sausage-shaped cartridges are inserted. When rotating a deformed rod through the cartridge and into the hole, the components are mixed and the curing action begins. When cured, the comprehensive strength of the resin is stronger than the surrounding rock.

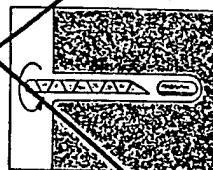
## EASY INSTALLATION INSTRUCTIONS



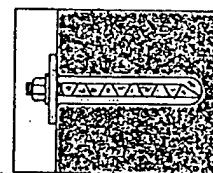
- Drill hole 1-2 inches shorter than bar length (do not over-drill).
- Use rotary-percussive equipment, not diamond drills.
- Clean hole of dust and debris.



- Insert proper number of cartridges.
- Resin should totally cover bolt. Refer to chart for proper amount.



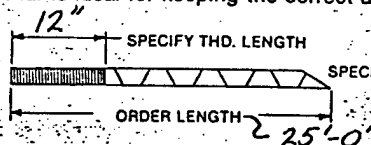
- Rotate bar slowly until it reaches the end of the hole.
- Spin the bar for 20-30 seconds, as rapidly as possible.
- The bar should have a minimum of 75 rotations.
- At 200-250 rpm a 15-20 second rotation is sufficient.
- Spin attachments are available from Williams for bolts and drills.



- Hold bar in place for 30-60 seconds, until the resin hardens.
- If the bar sags when the drill is removed, reattach the drill and hold the bar in place until it sets.
- Resin should totally cover bolt. Refer to chart for proper amount.

## R6J THREADED REBAR

Williams threaded rebar, resin and grout collars are recommended for rock bolting situations where anchor head assemblies are not applicable. When anchoring into overhead situations the grout collar is ideal for keeping the correct amount of resin in the hole.



## REBAR STRENGTH

GRADE 60 REBAR - ROLLED THREAD			
Rebar Number	Thd. Size	Min. Yield Strength thru Thrd.	Min. Ultimate Strength thru Thrd.
4	1/2" - 13 NC	18,500 lbs.	215,000 lbs.
5	5/8" - 14 NC	20,000 lbs.	224,000 lbs.
6	3/4" - 16 NC	22,000 lbs.	233,000 lbs.
7	7/8" - 18 NC	27,000 lbs.	260,000 lbs.
8	1" - 20 NC	36,000 lbs.	276,000 lbs.
9	1 1/8" - 22 NC	35,000 lbs.	276,000 lbs.
10	1 1/4" - 24 NC	58,000 lbs.	296,000 lbs.
11	1 3/8" - 28 UN	73,000 lbs.	323,000 lbs.
14	1 3/4" - 36 UN	114,000 lbs.	390,000 lbs.
18	2" - 48 UN	159,000 lbs.	265,000 lbs.

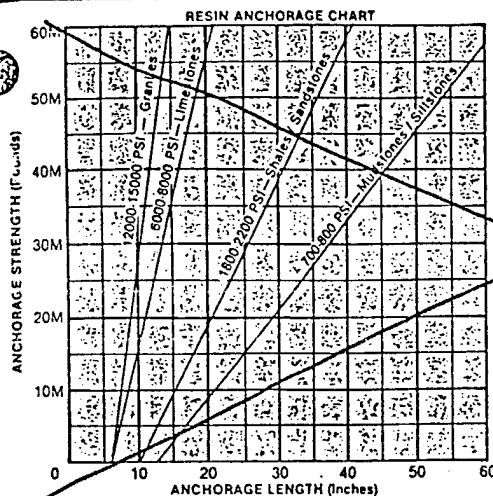
## PLASTIC REBAR COLLARS

Rebar Number	Thd. Size	Min. Yield Strength thru Thrd.	Min. Ultimate Strength thru Thrd.
4	1/2" - 13 NC	18,500 lbs.	215,000 lbs.
5	5/8" - 14 NC	20,000 lbs.	224,000 lbs.
6	3/4" - 16 NC	22,000 lbs.	233,000 lbs.
7	7/8" - 18 NC	27,000 lbs.	260,000 lbs.
8	1" - 20 NC	36,000 lbs.	276,000 lbs.
9	1 1/8" - 22 NC	35,000 lbs.	276,000 lbs.
10	1 1/4" - 24 NC	58,000 lbs.	296,000 lbs.
11	1 3/8" - 28 UN	73,000 lbs.	323,000 lbs.
14	1 3/4" - 36 UN	114,000 lbs.	390,000 lbs.
18	2" - 48 UN	159,000 lbs.	265,000 lbs.

All collars have a 4-5/16 O.D.

When ordering a bar to be used with resin cartridges, it should be ordered with a bevel cut to aid in shearing cartridges and mixing resin. Williams supplies a variety of threaded and deformed bars. For more information contact a representative.

# WILLIAMS



When fully cured, the resin is stronger than rock and most other materials into which it is likely to be used. Please refer to the following test data which is based on our standard resin cartridge. WILLIAMS FORM can supply higher or lower resin strengths to suit the application. Please contact a WILLIAMS representative for further information.

Uniaxial Compressive Strength 103.33N/mm<sup>2</sup> (15,000 lbf/in<sup>2</sup>)

Tensile Strength (beam test)	22.1 N/mm <sup>2</sup> (3,200 lbf/in <sup>2</sup> )
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Unconfined Shear Strength	52 N/mm <sup>2</sup> (7,500 psi)
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~~This chart is intended as a guide for on site trials which will establish the working specifications in the actual ground conditions.~~

DRILL HOLE FILL CHART (Per cartridge)

		CARTRIDGE SIZE - Diameter by standard length 305 mm = 12 inches											
		Imperial	Metric	7/8" (29)	1" (25mm)	1 1/16" (27mm)	1 1/4" (32mm)	1 3/8" (35mm)	1 9/16" (40mm)	1 3/4" (45mm)			
BOLT DIAMETER (BEAR SIZES) TYP. A 615 GRADE 60	No. 6 3/4"	20mm	20 (508)	15 1/2 (381)	12 1/2 (305)	14 1/2 (356)							
	No. 7 7/8"			21 (533)	16 (406)	18 1/2 (457)	14 1/2 (356)						
	No. 8 1"	25mm		21 1/2 (533)		18 1/2 (457)	13 (330)	15 1/2 (381)	12 1/2 (305)				
	No. 9 1 1/8"					16 1/2 (406)	12 1/2 (305)	20 1/2 (508)	14 1/2 (356)	14 1/2 (356)	12 1/2 (305)		
		30mm				19 1/2 (483)	13 (330)	23 1/2 (584)	15 1/2 (381)	12 1/2 (305)	15 1/2 (381)		
	No. 10 1 1/4"					16 (406)	19 1/2 (483)	13 (330)	17 1/2 (432)	13 (330)			
	No. 11 1 3/8"	35mm						18 1/2 (457)	21 1/2 (533)	15 1/2 (381)	12 1/2 (305)	16 (406)	
No. 14 1 3/4"	45mm								22 1/2 (559)		16 1/2 (465)		
WILLIAMS 50 KS ALL-THD-BAR (ASTM A722)	1 Norm. (26mm)						15 (381)	18 1/2 (457)	13 (330)				
	1 1/4 Norm. (32mm)							18 1/2 (457)	23 1/2 (584)	16 1/2 (406)	12 1/2 (305)	15 (381)	
	1 3/8 Norm. (36mm)								19 1/2 (483)	14 1/2 (356)	17 1/2 (432)	12 1/2 (305)	
DRILL HOLE DIAMETER		(25mm)		(28)	(30)	(32)	(35)	(38)	(41)	(45)	(48)	(51)	(57)
	1"	1 1/8"	1 3/16"	1 1/4"	1 3/8"	1 1/2"	1 5/8"	1 3/4"	1 7/8"	2"	2 1/4"		

~~SET~~ TIMES AVAILABLE:

- **Two-Four Minutes** — This is a standard gel time and used when insertion and rapid mixing can be achieved.
- **Fifteen-Thirty** — This is normally used with WIL LIAMS fast gelling cartridges to ensure complete grouting when pre-tensioned fully grouted bolts are required.

**ORDERING INFORMATION:**

~~WILLIAMS resin cartridges are ordered by size and type. Stock sizes manufactured can be found in the usage chart. The size of the cartridge required is the ordering part number. The Type refers to the gel time required.~~

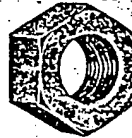
**EXAMPLE S6R-32-305-02-04**

dia. length set time (of cartridge)

## H1F HEX NUTS

Available in all rock bolt diameters.

Williams heavy hex nuts will develop ultimate strength of all rod diameters.

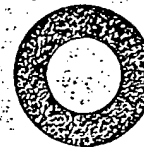


TAP SIZE	ACROSS FLATS	THICKNESS	PART NUMBER
3/8"	1 1/16"	23/64"	H1F-03
7/8"	1 3/8"	23/64"	H1F-04
1 1/8"	1 7/8"	23/64"	H1F-05
1 3/8"	2 1/8"	23/64"	H1F-06
1 7/8"	2 3/4"	23/64"	H1F-07
2 1/8"	3 1/8"	23/64"	H1F-08
2 3/8"	3 3/8"	23/64"	H1F-09
2 7/8"	3 7/8"	23/64"	H1F-10
3 1/8"	4 1/8"	23/64"	H1F-11
3 3/8"	4 3/8"	23/64"	H1F-12
3 7/8"	4 7/8"	23/64"	H1F-13
4 1/8"	5 1/8"	23/64"	H1F-14
4 3/8"	5 3/8"	23/64"	H1F-15
4 7/8"	5 7/8"	23/64"	H1F-16

NOTE:  
FOR 150 KSI STEEL BAR HEX NUTS, REFER TO PAGE 21.

## R8M BEVEL WASHERS

Bevel washers have small diameters for grouting applications. They do not interfere with the grout tube and maintain full bearing surface for the hex nut.

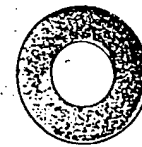


BAR DIAMETER	DEGREE OF BEVEL	PART NUMBER
3/8"	15°	R8M-04
7/8"	15°	R8M-05
1 1/8"	15°	R8M-06
1 3/8"	15°	R8M-07
1 7/8"	15°	R8M-08
2 1/8"	15°	R8M-09
2 3/8"	15°	R8M-10
2 7/8"	15°	R8M-11
3 1/8"	15°	R8M-12
3 3/8"	15°	R8M-13
3 7/8"	15°	R8M-14
4 1/8"	15°	R8M-15
4 3/8"	15°	R8M-16



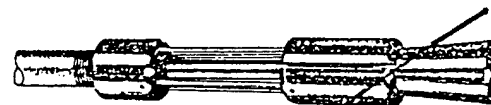
## R9F HARDENED WASHERS

BAR DIAMETER	PART NUMBER
3/8"	R9F-04
7/8"	R9F-05
1 1/8"	R9F-06
1 3/8"	R9F-07
1 7/8"	R9F-08
2 1/8"	R9F-09
2 3/8"	R9F-10
2 7/8"	R9F-11
3 1/8"	R9F-12
3 3/8"	R9F-13
3 7/8"	R9F-14
4 1/8"	R9F-15
4 3/8"	R9F-16



FOR HIGH TORQUING  
OF ROCK BOLTS

## K3F-21 DRILL HOLE GAUGE

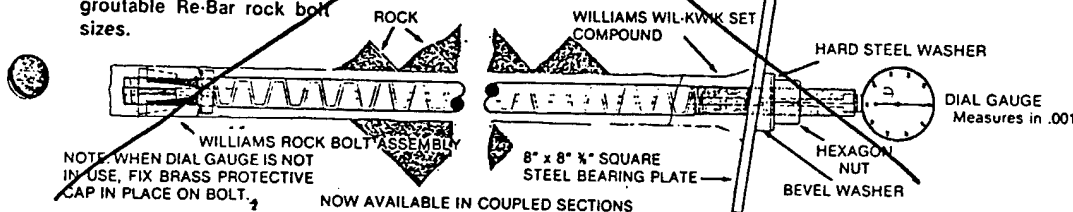


This new hole gauge from Williams measures the hole diameter with full bearing accuracy. This means the full bearing area of the rock bolt shell is measured — not just a contact point. The rugged design of unit permits it to slide in and out easily. Its simple operation requires no special training. Just a pull on the measurement rod will allow the gauge to be removed. Graduated measurements of hole diameters are accurately lineally stamped on

measurement rod to within 1/32" of hole diameter. The adjustable recalibration ring and lock nut simplify "in the field" recalibration of the unit. A checking ring gauge is also supplied. All parts of unit are stainless steel or galvanized to assure them of being corrosion resistant. The unit is available in any length with separate models for 1 1/2" to 2" holes and 2" to 3 1/2" holes.

## K3F-23 ROCK DEFORMETERS

Available in all hollow groutable Re-Bar rock bolt sizes.



NOTE: WHEN DIAL GAUGE IS NOT IN USE, FIX BRASS PROTECTIVE CAP IN PLACE ON BOLT.

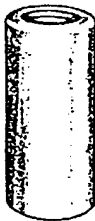
NOW AVAILABLE IN COUPLED SECTIONS

# WILLIAMS

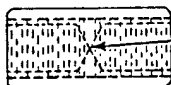
## ROCK BOLT ACCESSORIES

### C2T ROCK BOLT STOP-TYPE COUPLING

Williams stop-type couplings will meet or exceed the strength of the bars. The stop type design assures exact engagement.



FOR PLACING BOLTS UNDER TORQUE AND TENSION.



Allows grout passage when using Williams Hollow Rebar Rock Bolts.

Red. Dia.	Bar O.D.	Overall Length	Recommended Safe Working Load at Approx. 70,000 P.S.I. S.F. 10	Maximum Working Load (Elastic Limit)	Ultimate Strength
1-1/2"	1-3/4"	11-1/2"	17,000 lbs.	22,000 lbs.	26,000 lbs.
5/8"	1-1/8"	1-3/4"	27,000 lbs.	36,000 lbs.	41,000 lbs.
3/4"	1-1/8"	2-1/2"	39,000 lbs.	49,000 lbs.	59,000 lbs.
7/8"	1-1/4"	2-1/4"	50,000 lbs.	68,000 lbs.	76,000 lbs.
1"	1-1/2"	3"	61,000 lbs.	81,000 lbs.	92,000 lbs.
1-1/8"	1-5/8"	4"	87,000 lbs.	117,000 lbs.	131,000 lbs.
1-1/4"	1-7/8"	4-1/2"	95,000 lbs.	125,000 lbs.	143,000 lbs.
1-3/8"	2-1/8"	4-1/2"	122,000 lbs.	161,000 lbs.	184,000 lbs.
2"	2-1/4"	6-1/2"	294,000 lbs.	397,000 lbs.	441,000 lbs.
2-1/4"	2-7/8"	7-1/2"	39,000 lbs.	49,000 lbs.	59,000 lbs.
2-1/2"	3"	8"	61,000 lbs.	81,000 lbs.	92,000 lbs.
3"	3-1/2"	10"	81,000 lbs.	105,000 lbs.	122,000 lbs.
3-1/2"	4"	12"	210,000 lbs.	265,000 lbs.	315,000 lbs.

Reducer couplings and hex couplings available.

### S1K STEEL PLATES



ROUND HOLE



PATENTED KEYHOLE

Williams steel plates are standard with a round hole for shebolts or non-grouted rock bolts. Also available is a patented keyhole which provides free access for grout entry tube for grouted rock bolts. All holes are punched 1/8" over bolt size. Plates are painted to prevent corrosion.

Specify bolt size when ordering.

Plate Size  
~~1 1/2 x 6 1/2 x 6 1/2~~  
 7/8 x 8 x 8

PLATE SIZE		WT.	
Inches	Millimeters	Lbs.	Kgs.
1/4 x 4 x 4	6 x 100 x 100	1.1	0.5
1/4 x 6 x 6	6 x 152 x 152	2.4	1.1
3/8 x 6 x 6	10 x 152 x 152	4.7	2.1
3/8 x 8 x 8	10 x 203 x 203	6.8	3.1
1/2 x 5 x 5	13 x 127 x 127	3.3	1.5
1/2 x 8 x 8	13 x 203 x 203	9.0	4.1
3/4 x 6 x 6	19 x 152 x 152	7.7	3.5
3/4 x 8 x 8	19 x 203 x 203	11.0	5.0
1 x 4 x 4	25 x 100 x 100	7.6	3.4
1 x 6 x 6	25 x 152 x 152	17.6	8.0
1 x 8 x 8	25 x 203 x 203	24.0	11.0
1-1/4 x 5 x 5	31 x 127 x 127	10.8	4.9
1-1/4 x 8 x 8	31 x 203 x 203	27.6	12.5
1-1/2 x 5 x 5	38 x 127 x 127	20.2	9.2
1-1/2 x 8 x 8	38 x 203 x 203	60.0	27.3

\*Designed for use with 150 KSI Steel Bars.

### E-1 EYE BOLTS



FIG. 1



FIG. 2



FIG. 3



FIG. 4

Williams® eyebolts may be used as lifting eyes for forms, concrete blocks, concrete cylinders, machinery or equipment. The large base on three of the models makes them excellent for anchoring guy wires.

SAFETY FACTORS AND WORKING LOADS BASED ON THE ULTIMATE STRENGTH OF THE EYEBOLTS SHOULD BE DETERMINED FOR THE SPECIFIC APPLICATION BY

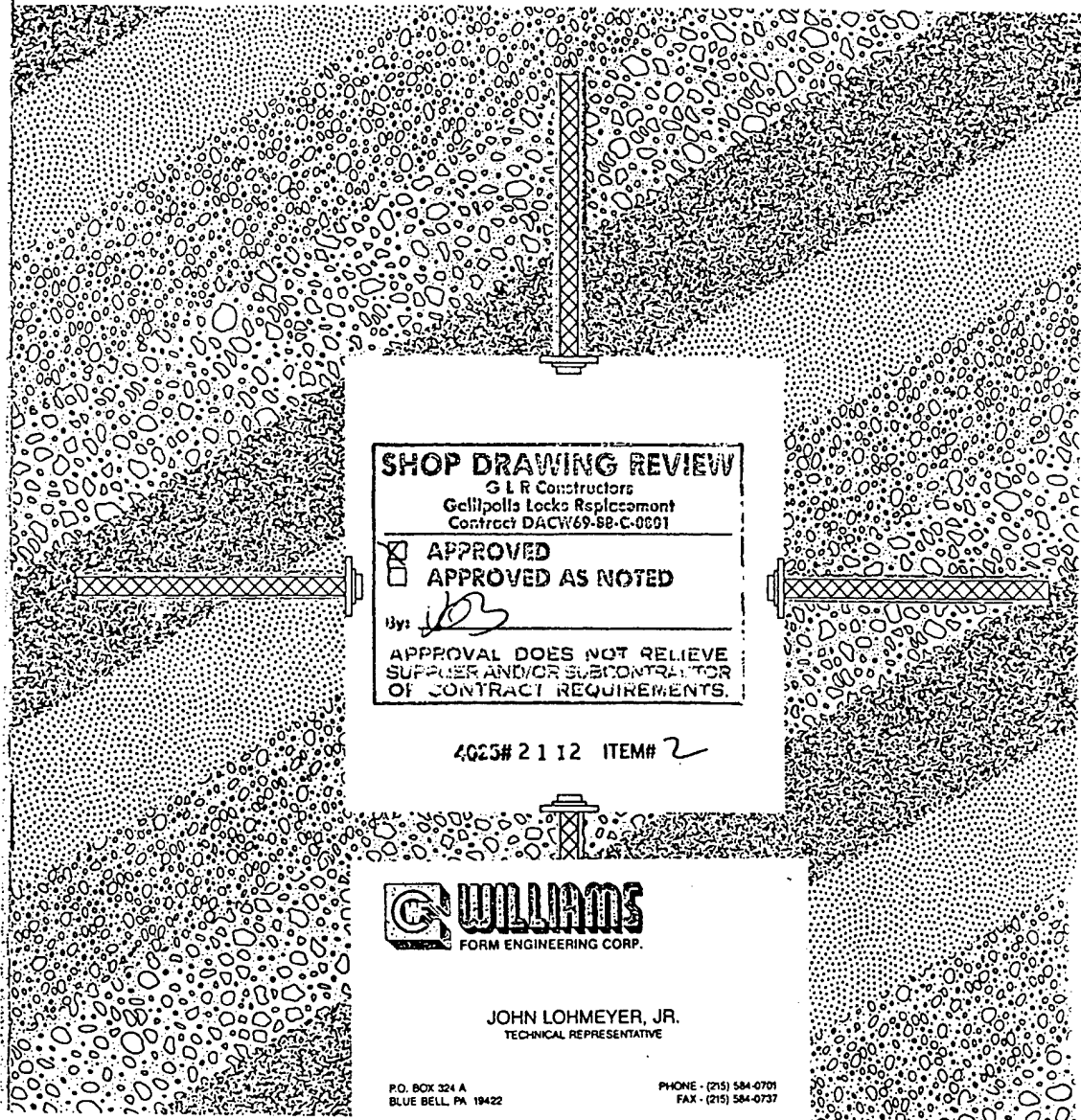
PART NO.	FIG.	INSIDE WIDTH	INSIDE HEIGHT	RING DIA.	OVER ALL HT.	STRAIGHT EXTENSION
NEB-1 MALLEABLE	FIG. 1	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-2 MALLEABLE	FIG. 2	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-3 MALLEABLE	FIG. 3	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-4 MALLEABLE	FIG. 4	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-5 MALLEABLE	FIG. 5	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-6 MALLEABLE	FIG. 6	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-7 MALLEABLE	FIG. 7	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-8 MALLEABLE	FIG. 8	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-9 MALLEABLE	FIG. 9	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-10 MALLEABLE	FIG. 10	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-11 MALLEABLE	FIG. 11	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-12 MALLEABLE	FIG. 12	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-13 MALLEABLE	FIG. 13	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-14 MALLEABLE	FIG. 14	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-15 MALLEABLE	FIG. 15	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-16 MALLEABLE	FIG. 16	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-17 MALLEABLE	FIG. 17	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-18 MALLEABLE	FIG. 18	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-19 MALLEABLE	FIG. 19	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000
NEB-20 MALLEABLE	FIG. 20	1-1/2"	1-1/2"	1-1/2"	1-1/2"	45,000

11-K-18



# FASLOC<sup>®</sup>T

resin anchored bolt system  
for civil engineering applications




**SHOP DRAWING REVIEW**  
G L R Constructors  
Gallipolis Locks Replacement  
Contract DACW69-88-C-0001

☒ **APPROVED**  
☐ **APPROVED AS NOTED**

By: *[Signature]*

APPROVAL DOES NOT RELIEVE  
SUPPLIER AND/OR SUBCONTRACTOR  
OF CONTRACT REQUIREMENTS.

4023# 2 1 12 ITEM# 2

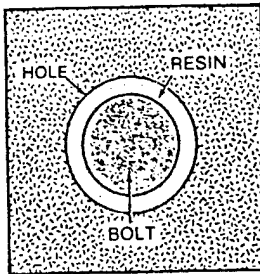
  
**WILLIAMS**  
FORM ENGINEERING CORP.

JOHN LOHMEYER, JR.  
TECHNICAL REPRESENTATIVE

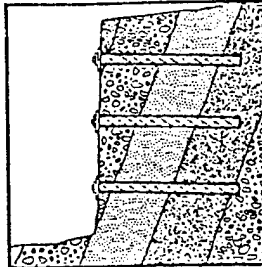
P.O. BOX 324 A  
BLUE BELL, PA. 19422

PHONE - (215) 584-0701  
FAX - (215) 584-0737

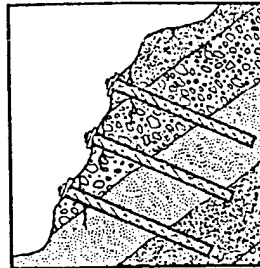
# a need to improve rock support



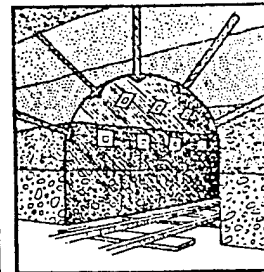
**a. THE FASLOC®  
COMPONENTS**



**b. RIB STABILIZATION**



**c. SLOPE  
STABILIZATION**



**d. TUNNEL SUPPORT**

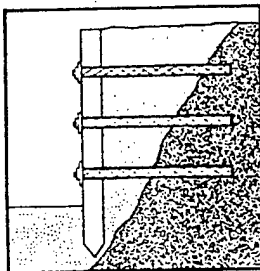
The purpose of a rock bolt system is to resist strata movement. Generally the load taken by the rock bolt support system depends largely on the development of frictional force between the surface of the rock and the rock bolt anchorage system. Anchorage integrity depends upon the extent to which these forces are developed and a rock bolt system should achieve as

much anchorage as possible with the inside surface of the hole in which it is placed. The FASLOC® resin anchored bolt system uses a high strength polyester resin to anchor the entire length of the steel bolt to the surrounding rock strata. (See illustration a.) This unification of the resin, bolt and strata layers provides the necessary strength and rigidity to

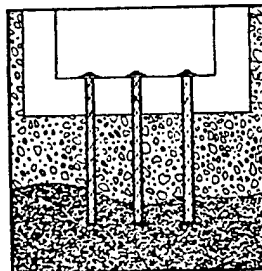
anchor the individual stratified layers and resist further movement and deterioration. Examples of typical installations are shown in the illustrations (b, c, d, e, f, and g). Theoretical analysis suggests that the reinforcement effect of the FASLOC resin bolt system may be increased by pretensioning the bolts to some value usually between

50% and 80% of the yield point of the bolts. This can be accomplished by using a fast-setting FASLOC resin at the "in-hole" end and a slower FASLOC resin "outby" that will set and hold the pre-tension that has been applied to the bolt. Pre-tension specifications are usually set by the designer. See page 9 for pre-tension installation techniques.

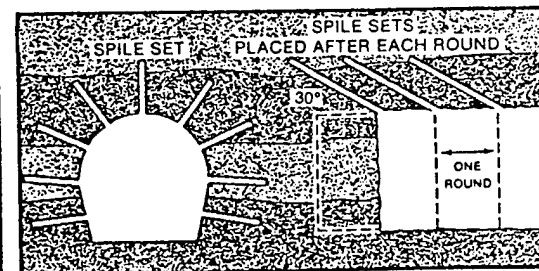
**e. TIE-BACKS**



**f. TIE-DOWNS**



**g. SPILING REINFORCEMENT AHEAD OF FACE**



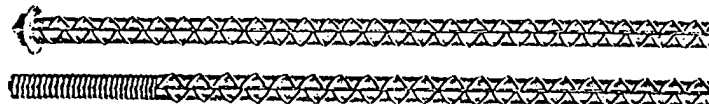
# DuPont has the answer

## FASLOC<sup>®</sup> T resin anchored bolt system

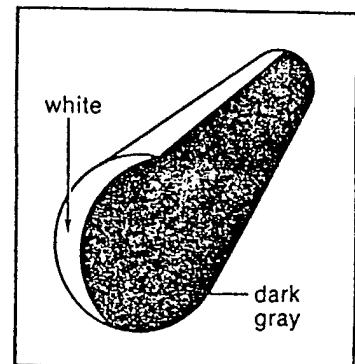
... composed of a  
unique resin cartridge  
and a steel bolt



h. THE CARTRIDGE



i. THE BOLTS



j. CROSS SECTION

The polyester resin in the cartridge is used to anchor the entire length of the bolt to the surrounding strata. This unification of the resin, bolt, and strata layers provides the necessary strength and rigidity to prevent the sag by acting as a reinforcement which anchors the individual stratified layers of rock into a single high strength beam.

The two-compartment

cartridge shown in the illustration (h) above consists of a heat-sealed tube of MYLAR<sup>®</sup> polyester film clipped at both ends. One compartment contains a dark gray resin; the other, a white catalyst. A cross section of this structure is shown in the illustration (j) above. Two typical steel bolts are shown above (illustration i).

A film barrier of MYLAR

prevents migration between the resin and the catalyst to provide optimum shelf life. The excellent chemical resistance of MYLAR minimizes the migration from the inside and the absorption of the atmosphere moisture from the outside. The light-weight, dimensionally stable casing of MYLAR is strong enough to withstand rough handling, but shreds

quickly and thoroughly during the installation procedure. The Du Pont resin formulation is thixotropic and fast setting. This reduces viscosity during insertion of the bolt and permits relatively low force and torque. The results are fast installation, rapid achievement of full strength, and a minimum tendency for ungelled resin to drip from the holes during installation.

Table 1

### Physical Properties of Cured Resin

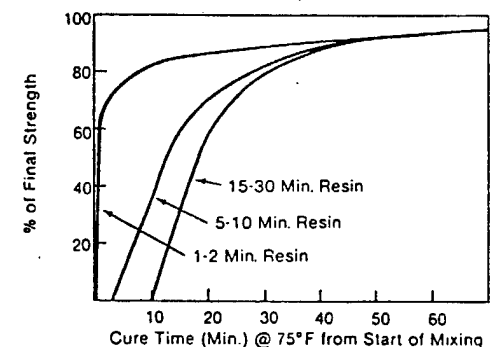
	FASLOC <sup>®</sup> T
Compressive Strength (PSI)	15,600
Compressive Mod. (10 <sup>6</sup> PSI)	1.3
Shear Strength (PSI)	5,000
Flexural Strength (PSI)	4,000
Flexural Modulus (10 <sup>6</sup> PSI)	1.7

Due to difficulty of preparing ASTM test specimens with fast gelling (setting) resins, above properties derived from 5-10 minute (0510) gel time FASLOC T. Field experience

indicates that all FASLOC T cured resins produce comparable anchorage strengths. Specific applications should specify field pull tests under actual job conditions. (See Table 2, page 4.)

Figure 1

### Resin Strength vs. Cure Time



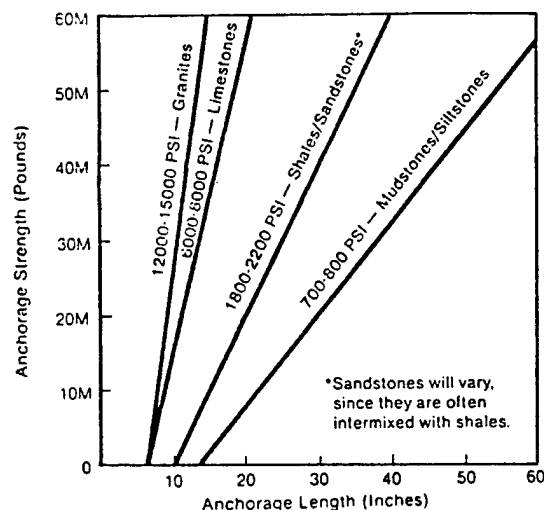
# 1

strata  
dowelled . . .  
strong  
anchorage  
in a variety  
of strata

# 2

tension  
develops  
internally  
with  
application  
of load

**Figure 2**  
**Resin Anchorage Related to**  
**Compressive Strength of Rock**  
**(Inches of Length/Pounds of Strength)**



**NOTES:**

1. This chart represents the range of anchorage strengths for estimating requirements.

2. Depending upon the compressive strength of the rock being considered, the diameter of the hole

may affect the anchorage strength — the larger the diameter, the larger the contact area.

3. Pull tests under field conditions should be used to determine actual requirements.

Competent anchorage has been obtained with the Du Pont FASLOC T system in a variety of formations. (See Figure 2.)

Field tests have shown that FASLOC offers increased resistance to anchorage failure caused by blasting or vibration.

The combined anchorage strength of the resin and the bolt exceeds the yield point of the steel bolt. Pull tests dramatically illustrate the anchoring strength of the FASLOC T system. (See Table 2.)

**Table 2**  
**Typical Anchorage Strength**  
**Obtained with FASLOC® T**

FASLOC T — 1-9/16" x 12" — 5-10 Minute Gel Time

Test No.	Rock Type	Appx. Anchor Length (In.)	Max. Load (Lbs.)	Load/Inch (Lbs./In.)
3	I B	20	127,188	6359
4	I B	20	134,000	6700
1	II B	20	72,188	3609
2	II B	20	99,688	4984
5	III B	20	85,938	4297
6	III B	20	110,000	5500
7	IV A	20	92,813	4641
8	IV A	20	99,688	4985

1 1/8" dia. holes — Grade 60 rebar # 11 (1 1/8" dia.) bolts.

**NOTES:**

**CLASS DESCRIPTION**

Ib Massive to slightly blocky, no alteration, joint spacing 1.0 feet or greater.  
 IIb Moderately blocky, little or no alteration, joint spacing 0.5 feet or greater.  
 IIIb Very blocky, moderately to highly altered, joint spacing less than 1.0 feet.  
 IVa Highly crushed and altered, non-plastic, abundant clay, joint spacing less than 0.5 feet.

# 3

smooth  
stress strain  
curve . . .  
no bleed  
off

Full-length resin anchored bolts provide effective resistance to changing rock strata stresses throughout their entire length, thereby assuring satisfactory stabilization of rock strata over long periods of time.

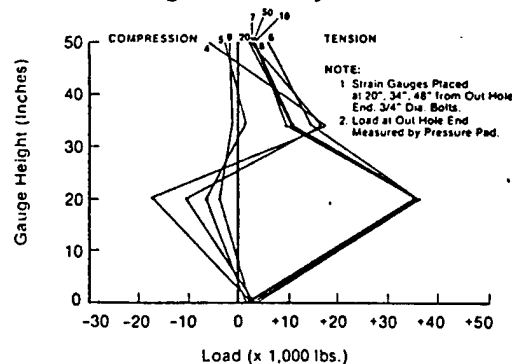
Strain-gauged, full-length grouted resin bolts installed in rock strata have shown that axial loads vary

continuously along each bolt length. This is shown in Figure 3.

It is quite common to find portions of a bolt in compression while other parts are in tension.

Cyclic upward/downward movement has been recorded although the dominant trend is downward. (See Figure 4.)

**Figure 3**  
Axial Load Variation  
Over Bolt Length 0-50 Days



# 4

resists  
vertical  
and lateral  
strata  
movement

The Du Pont FASLOC T system is designed to resist both vertical and lateral movements of rock strata, the most common cause of failure.

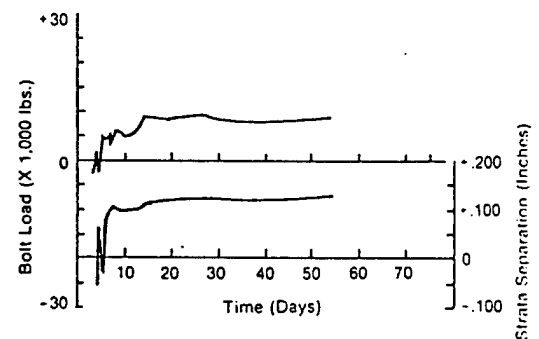
# 5

complete  
sealing  
of bolt  
and hole

The full-length resin anchorage effectively seals wet, dripping holes and, in most cases, eliminates further deterioration of the hole and surrounding strata. The fully-encased bolt is also protected from eventual weakening due to corrosion.

The Du Pont resin anchored bolt system is unaffected by sea water, fresh water, mild acids or mild alkalis.

**Figure 4**  
Typical Strain-Gauged Bolt Load-Strata  
Separation Time Series.

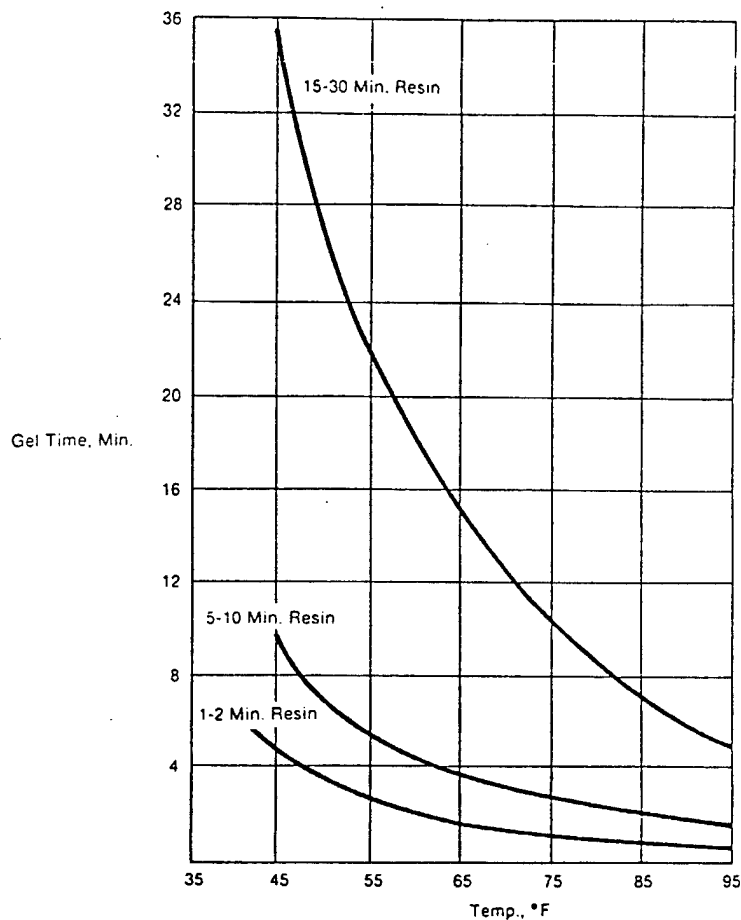


# resin cartridge specifications

**Figure 5**  
**Gel Time**

A wide range of gel times is offered for varied conditions. The standard one-minute (0001) and two-minute (0002) gel times meet most underground mine requirements.

However, for special conditions, where installations are difficult or full length anchored tensioned bolts are used, two additional longer gel times are available. These are 5-10 minute (0510) and 15-30 minute (1530). The gel times are standardized at 55-60°F. The effect of temperature on gel times is shown in Figure 5.



## GEL TIME COLOR CODE FOR FASLOC® CARTRIDGES

Color Code	Gel Time @ 55°F
Green	1-2 Minutes
Red	5-10 Minutes
Blue	15-30 Minutes

Table 3

## Cartridge and Box Specifications for FASLOC® T

Cartridge Size <sup>(1)</sup>	Gross Box Wt.	Ctgs./Box	Boxes Per Pallet	Gross Weight (Lbs.) Per Pallet (Including Pallet)
.9" x 12"	56	100	40	2285
1" x 12"	50	80	40	2045
1-1/16" x 12"	45	60	40	1845
1-1/4" x 12"	52	50	40	2125
1-3/8" x 12"	49	40	40	2005
1-9/16" x 12"	44	28	48	2157
1-15/16" x 12"	38	16	56	2173

Table 4

## Inches of Cartridge to Grout One Foot of Bolt for Bolt-Cartridge-Hole Diameter Combination Selected.

	Cartridge Diameter											
	.9"	1"	1-1/16"	1-1/16"	1-1/4"	1-1/4"	1-3/8"	1-9/16"	1-9/16"	1-9/16"	1-15/16"	1-15/16"
# 6 3/4"	6.5"	8.4"	7.5"									
# 7 7/8"	6.0"	5.3"	8.5"	8.6"								
# 8 1"			6.0"	6.8"	9.6"	10.4"						
# 9 1-1/8"				4.8"	7.6"	8.7"	8.8"					
# 10 1-1/4"					5.3"	6.9"	7.4"	9.6"			9.5" <sup>(1)</sup>	
# 11 1-3/8"								5.8"	8"	10.4"	8.4"	10" <sup>(1)</sup>
# 12 1-1/2"									6.2	8.6	7.3	9.0
# 13 1-5/8"										6.7	6.0	7.8
# 14 1-3/4"										4.6"	4.7"	6.4"
	1"	1-1/8"	1-1/8"	1-1/4"	1-3/8"	1-1/2"	1-5/8"	1-3/4"	1-7/8"	2"	2-1/8"	2-1/4"
	Hole Diameter											

## NOTES:

- Grouted lengths shown make no allowance for over-drilling and hole irregularities. Calculations for requirements should include some overage.
- Table 4 shows commonly used combinations of bolt-cartridge-hole diameters. Your Du Pont representative should be consulted when other combinations are being considered. See note <sup>(1)</sup>.

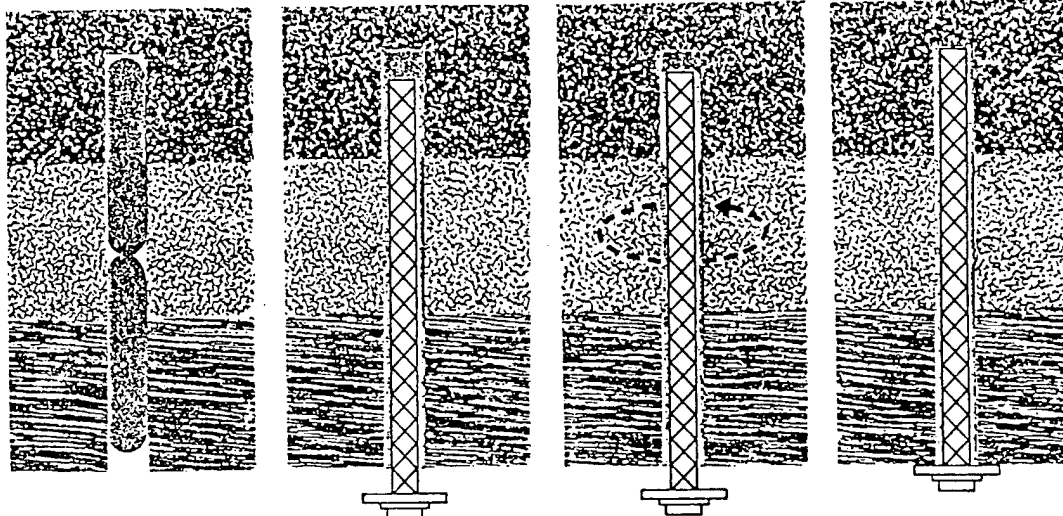
<sup>(1)</sup> Standard cartridge lengths are 12". Other lengths are available on request.

<sup>(2)</sup> Use where couplers are required. Not recommended for single uncoupled bolts. Use next smaller dia. hole shown on Table 4 for single uncoupled bolts.

*Use Williams Table w/Allowance*

# Installation procedures for FASLOC® T resin bolt system

## Non-Tensioned Bolts



**1** Insert necessary resin cartridges into the hole.

**2** Push the bolt into the hole to a point just below the roof line. Turning of the bolt during this step is optional. Threaded bolts may be pushed home.

**3** Rotary drills:  
Rotate the bolt rapidly for 10-20 seconds.  
Percussion drills:  
Rotate the bolt 40-60 revolutions.

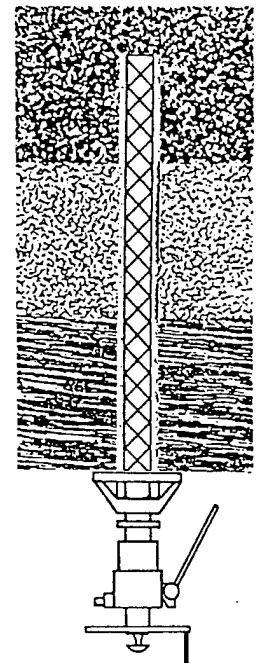
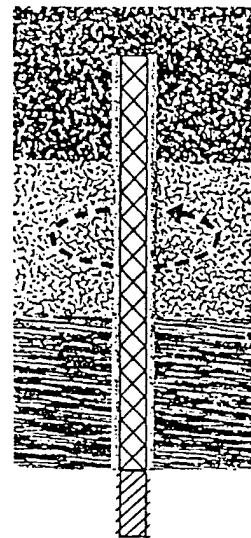
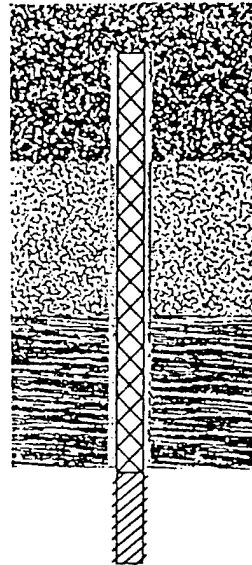
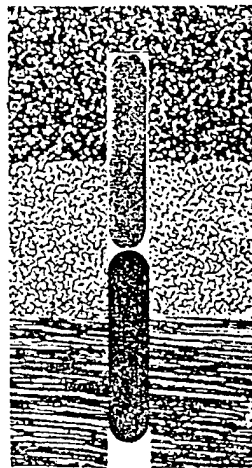
**4** Push the bolt upward with the maximum thrust available from the machine and hold until resin hardens. Do not rotate after Step 3. Damage to partially gelled resin may result.

The recommended installation procedures should be followed very carefully to insure successful application of FASLOC resin bolting.

□ Resin bolts should be installed as soon as possible in newly-exposed roof. Roof that has been allowed to shift or sag offers the least chance for successful support.

□ Do not use ruptured or broken cartridges. Damaged cartridges should be removed from the mine or job site.

## Pre-Tensioned Bolts



- 1 After drilling hole, insert necessary resin cartridges with the fast-setting cartridges (shown in blue above) at the "in-hole" end to anchor the bolt prior to tensioning. Then insert the slow-setting cartridges outby (shown in black above).

**Caution:** If hole has been overdrilled, be certain that sufficient fast-set cartridges are used at the back of hole to develop the bolt anchorage required for the subsequent pre-tensioning.

- 2 Push the bolt into the hole. Turning of the bolt during this step is optional.

- 3 **Rotary drills:** Rotate the bolt rapidly for 10-20 seconds.  
**Percussion drills:** Rotate the bolt 40-60 revolutions.

- 4 It may be necessary to use quick-setting mortar to provide the proper surface for mounting the bearing plate on the rock surface at right angles to the bolt. As soon as fast-setting cartridges gel — but before slow-setting cartridges gel — begin the pre-tensioning. Pre-tensioning may be done with hydraulic ram, mechanical tensioner, or torque wrench depending on requirements set by designer. When slow-setting cartridges gel, the installation is complete.

For maximum shelf-life, FASLOC cartridges should be stored away from direct sunlight in a reasonably cool, well-ventilated, dry area. Storage life is up to 1 year dependent on ambient temperature conditions. Under adverse conditions shelf-life is reduced. To insure proper storage, the product should not be subjected to temperatures in excess of 85°F for prolonged periods. Storage is recommended under cover, on original pallets with adequate ventilation. If stored in trailers in hot weather, doors should be left ajar or a sun screen erected over the trailer. Conversely, while cold storage does not adversely effect the shelf-life of FASLOC, it should be warmed to a range of 50°-60°F before using to assure gel times within the specified range (see Figure 5). The time required for boxes of FASLOC to warm or cool to ambient temperature is dependent on both the initial temperature and how the boxes are stacked. Where the initial temperature is anywhere between 25° and 85°F, cases will come within 5° of ambient temperature in 48 hours when

stacked in single columns with 4 sides of each box exposed to the air. Multiple columns should be separated by at least 2 inches to assist air circulation between columns. Resin cartridge cases should be stacked preferably six high with a maximum never to exceed nine cases. Overstacking will crush the cases resulting in ruptured resin cartridges. Pallets should not be stacked. It is essential that stacks be rotated so that the oldest stock is the first out.

The superior quality of the Du Pont FASLOC® T resin bolt system is assured through a three part quality control program.

- ingredient testing
- in-process control tests
- finished product acceptance testing

Testing levels and specifications for each of these programs have been established statistically based on actual historical data, to insure the customer receives a uniform quality product which will perform dependably under field conditions.

#### Ingredient Testing

All vendors are required to certify that each lot of ingredients meets our stringent specification and furnish data that supports the certification. In addition each ingredient is rechecked and verified through testing in our laboratory.

#### In-Process Control Test

Testing of materials as mixed, prior to packaging is conducted at specified frequencies and again must meet specifications for the following parameters:

- resin viscosity
- gel time at 55°F and 75°F
- percent of activator
- percent of inert filler

In addition mixed samples of resin and activator are tested for:

- shear strength
- pull strength

#### Finish Product

##### Acceptance Testing

To further assure quality of product being shipped the following seven parameters of the finished product, although automatically controlled, are manually inspected and tested on a lot to lot basis.

- cartridge length
- cartridge diameter
- resin to activator ratio
- viscosity of resin
- gel time
- cartridges/box
- box labeling and coding

In addition samples of each lot are retained at the plant for future reference, if required.

The data generated by all the testing is reviewed on a regular basis by our Quality Control Engineer who guides our revisions to testing levels and specifications in a continuing effort to provide improved quality products for the customer.

## safe handling precautions

## how to put DuPont FASLOC<sup>®</sup>T to work for you

**Caution:** Do not open or puncture cartridge. Physical contact with liquid contained in cartridge may cause mild irritation. Safety glasses or eye shield should always be used when roof bolting is done. In case of eye contact, immediately flush with plenty of water for at least 15 minutes. Call a physician.

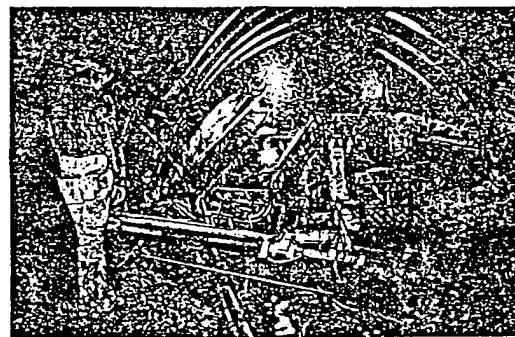
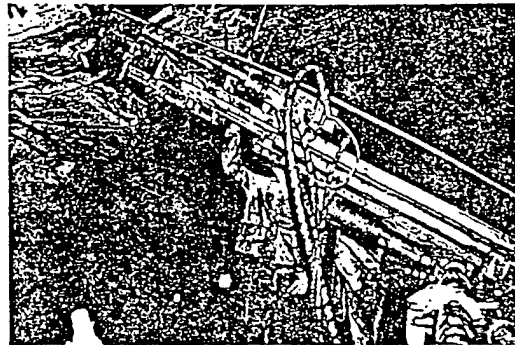
In case of skin contact, flush skin with water. Prolonged contact with skin may cause mild irritation. Irritation should subside when material is removed.

Cartridges are filled with inert fillers, water, polyester resin and activator (active ingredients include low levels of styrene and modified benzoyl peroxide). Du Pont resin cartridges are for industrial use only and are intended for use in conjunction with bolts. The relationship between hole dimensions, bolt size and the size and number of cartridges is critical to good performance. Your Du Pont representative will be glad to assist in determining the proper combinations for specific applications.

**For technical information call 1-800-332-3308. To place an order or other sales service assistance call 1-800-255-8384.**

The facts stated and the recommendations made herein are based on our research and research of others, are offered free of charge, and are believed to be accurate. No guarantee of their accuracy is made, however, and the products discussed are distributed without warranty, expressed or implied, and upon condition that recipients shall make their own tests to determine the suitability of such products for their particular purposes. Likewise, statements concerning the possible uses of our product are not intended as a recommendation to use it in the infringement of any patent, whether owned by Du Pont or by others.

FASLOC® T In use:



Du Pont Company  
Fabricated Products Department  
Anchorage Systems  
Potomac River Works  
P.O. Drawer 863  
Martinsburg, W.V. 25401  
1-800-332-3308



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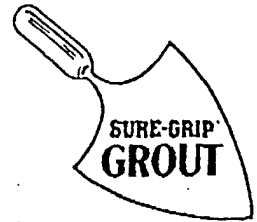
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# DAYTON SUPERIOR®

## TECHNICAL DATA

### Sure-Grip High Performance Grout™

Non-Shrink, Non-Metallic, High Early Strength



#### PRODUCT DESCRIPTION:

Sure-Grip High Performance Grout is a ready-to-use, non-shrink, non-corrosive, non-metallic grout formulated and produced with the highest quality raw materials available. It is a cement-based grout designed to deliver a high rate of flow with excellent density (for dynamic loads) and a high compressive strength. In fact, Sure-Grip Grout not only delivers high compressive strength quickly - 5,000 psi in one day - but it also delivers an outstanding compressive strength at 28 days, over 10,000 psi! Sure-Grip Grout's high early strength means an earlier project completion time for contractors and less down time for machines. Sure-Grip is also designed to provide an effective load bearing surface through its non-shrink properties and it contains no chlorides or any component that could cause corrosion, rusting or bleeding.

#### PURPOSE:

Sure-Grip High Performance Grout is an ideal product for interior or exterior grouting of architectural and structural precast concrete components, structural column base plates, machinery bases, anchoring bolts, cable anchorages, dowels, bearing pads, keyway joints and crane rails. It also finds excellent applications in power plants, steel mills, paper mills, oil refineries, food plants as well as sewage and water treatment plants.

#### ADVANTAGES:

- High Compressive Strength Quickly - 5,000 psi in One Day
- Less Downtime For Machines
- Contractors Can Finish Projects Sooner
- High Ultimate Compressive Strength - 10,000 psi in 28 days
- Non-Shrink
- Non-Metallic/Non-Corrosive
- High Density
- Low Water Requirements
- High Fluidity/Pourable/Pumpable
- Resistant to Heat and Thermal Shock
- Interior/Exterior Applications
- Resists Water and Salt Penetration and Damage From Freeze-Thaw Cycles
- Approved by Numerous State D.O.T.'s

#### MEETS SPECIFICATIONS:

Corps of Engineers Specification for Non-Shrink Grout: CRD-C 621

ASTM C-827 - Sure Grip Grout yielded a controlled positive expansion

Sure-Grip High Performance Grout has been approved by numerous State D.O.T.'s and other approval agencies.

(Continued on Back)

#### TEST RESULTS - CORPS OF ENGINEERS CRD-C 621

Fluidity	Water Content <small>(gals per 100 lbs bag)</small>	Flow <sup>W</sup>	Expansion (%)			Compressive Strength (PSI)			
			@3 days	@14 days	@28 days	@1 day	@3 days	@7 days	@28 days
Plastic	6 pls.	100	+ .02	+ .01	+ .01	6500	8000	10,000	12,500
Flowable	7 pls.	130	+ .01	+ .01	+ .01	6000	8000	10,000	11,000
Fluid	8-9 pls.	30 sec.	+ .01	+ .01	+ .01	4000	7000	8500	10,000

(a) Minimum and moderate fluidities are measured at five drops on a flow table corresponding to CRD-C 226. The specified flow range for minimum fluidity is 100-125, and for moderate fluidity 124-145. High fluidity is measured through a flow cone per CRD-C 811 with a specified efflux time of 10-30 seconds.

#### WARRANTY

The Dayton Superior Corporation ("the Company") will refund the price of or replace, at its election, any product which it finds to be defective provided the product has been used properly. EXCEPT AS EXPRESSLY STATED ABOVE, THE COMPANY MAKES NO WARRANTY OF MERCHANTABILITY AND NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE NOR DOES IT MAKE ANY WARRANTY, EXPRESS OR IMPLIED, OF ANY NATURE WHATSOEVER WITH RESPECT TO THE PRODUCT OR THE USE THEREOF. BY WAY OF ILLUSTRATION AND NO LIMITATION, IN NO EVENT SHALL THE COMPANY BE LIABLE FOR DELAY CAUSED BY DEFECTS, FOR LOSS OF PROFITS, FOR UNDETERMINED OR CONSEQUENTIAL DAMAGES OR

#### DISTRIBUTED BY:

Dayton Superior Corporation

August 1989

## APPLICATION INSTRUCTIONS:

### SURFACE PREPARATION:

Thoroughly clean all contact surfaces. Existing concrete should be strong and sound. Maintain contact areas between 50 degrees and 80 degrees F. before grouting and during curing period. For hot and cold weather applications, contact Dayton Superior. Thoroughly wet concrete contact area 24 hours prior to grouting, keep wet, and remove all surface water just prior to placement.

### MIXING:

A mechanical mixer with rotating blades is best. Small quantities can be mixed with tools by hand. Place approximately  $\frac{1}{4}$  of the anticipated mix water into the mixer, add the grout and mix, adding the minimum additional water necessary to achieve the desired consistency.

### WATER REQUIREMENTS

Desired Mix	Water Per 55 lb. Bag
Plastic	6 Pints
Flowable	7 Pints
Fluid	8-9 Pints

Mix for a total of five minutes ensuring uniform consistency. For placements greater in depth than 3", up to 25 pounds of washed pea gravel ( $\frac{3}{4}$ " maximum size) may be added to each 55 pound bag of grout.

The approximate working time (pot life) is 30 minutes. This will vary somewhat with ambient conditions.

### PLACEMENT:

Grout should not be placed so as to avoid entrapped air pockets. Grout should not be over-worked causing segregation. Vent holes should be provided where necessary. Forms must be sealed to prevent water or grout loss. When possible, grout bolt holes first. Placement and consolidation should be continuous for any one section of the grout. When nearby equipment causes vibration of the grout, such equipment should be shut down for a period of eight hours.

### FINISHING AND CURING:

Forms may be removed when grout is completely self-supporting. Cut away areas where grout excessively restricts movement of steel, i.e., edges of base plates, etc. For best results, grout should extend downward at a 45 degree angle from the lower edge of the steel base plates or similar structures. Exposed grout surfaces should be cured. Dayton Superior recommends using: Day-Chem Cure & Seal: 26%. Maintain the temperature of the grout and contact area at 50 degrees to 80 degrees Fahrenheit for a minimum of 24 hours.

### SPECIAL CONDITIONS:

In hot or cold temperatures, or unusual conditions such as mass pours, thin layers, extreme temperature service, restraint of movement, or long distance pumping are anticipated, contact DSC for specific recommendations.

### APPROXIMATE YIELD:

.46 cubic feet per 55 lb. bag

.62 cubic feet per 55 lb. bag extended with 25 lbs. of washed pea gravel ( $\frac{3}{4}$ " maximum size)

### PACKAGING:

55 lb. multi-wall, plastic lined bags (24.95 kg.)

### CLEAN-UP:

Use clean water.

### LIMITATIONS:

Do not retemper after initial mixing. Do not add other cements or additives to Sure-Grip Grout.

Setting time for Sure-Grip Grout will slow down during cold weather (less than 50 degrees F.) and speed up during hot weather (greater than 80 degrees F.). Contact Dayton Superior for specific recommendations.

Exposed grout surfaces should be cured. Dayton Superior recommends using: Day-Chem Cure & Seal: 26% (meets ASTM C-309).

Store in a cool, dry area that is free from moisture and direct sunlight.

### WARNING:

Avoid direct contact with skin and eyes. Product contains Portland Cement. Wash exposed skin area promptly with water. May cause skin irritation and possibly cement burns. In case of eye contact, flood eyes repeatedly with water and call physician. Do not take internally. Harmful if ingested. Keep product out of reach of children. See Material Safety Data Sheet for additional information.

### TECHNICAL SERVICES:

Call our technical staff for assistance at:

1-800-435-9618  
1-800-892-6684 (In Illinois)  
1-815-732-3136  
or  
Fax: 1-815-732-2866

Also Dayton Superior's coast-to-coast network of distributors and dealers are well informed on capability and application procedures.

VENDOR SERVICES

Dupont Company

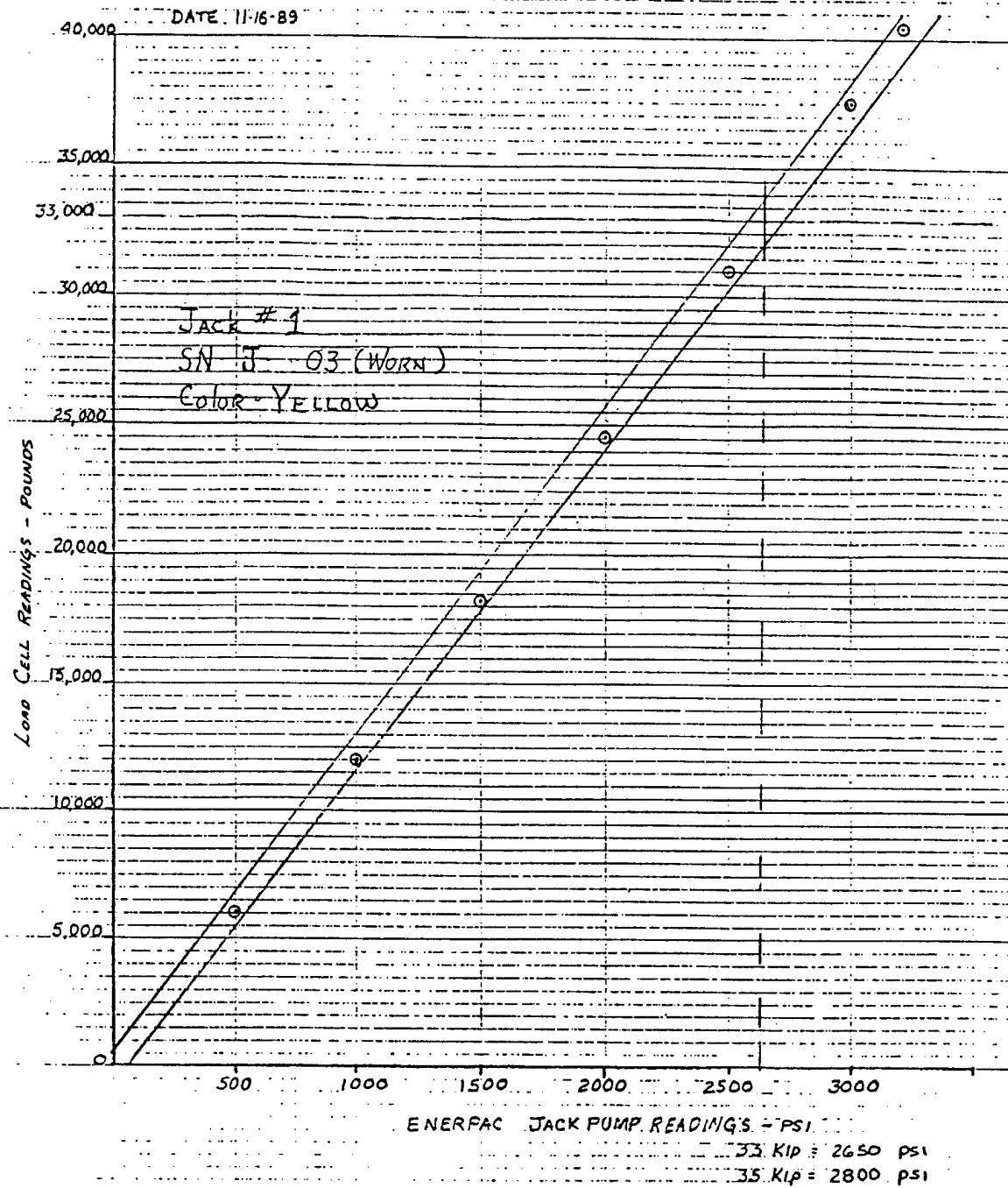
1-800-332-3308

Technical services for  
Fasloc-T resin cartridge  
systems.

Williams Form Engineering

1-215-584-0701

John Lohmeyer, Jr. -  
Sales representative for  
grade 60 anchor bars and  
accessories.



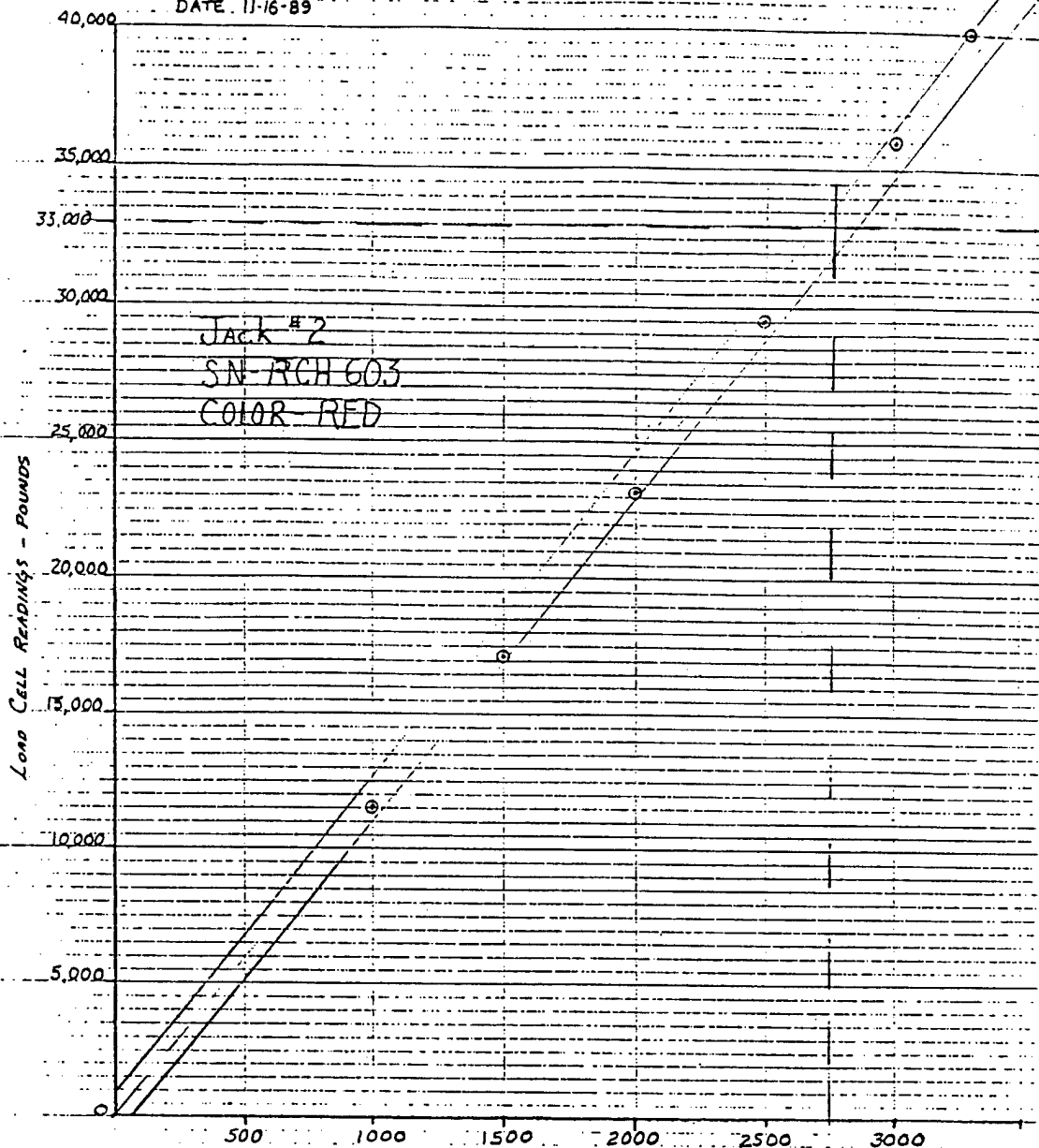
Model 112506

CHART - LOADS

INSPECTOR: NUGEN

SN: CPC

DATE: 11-16-89

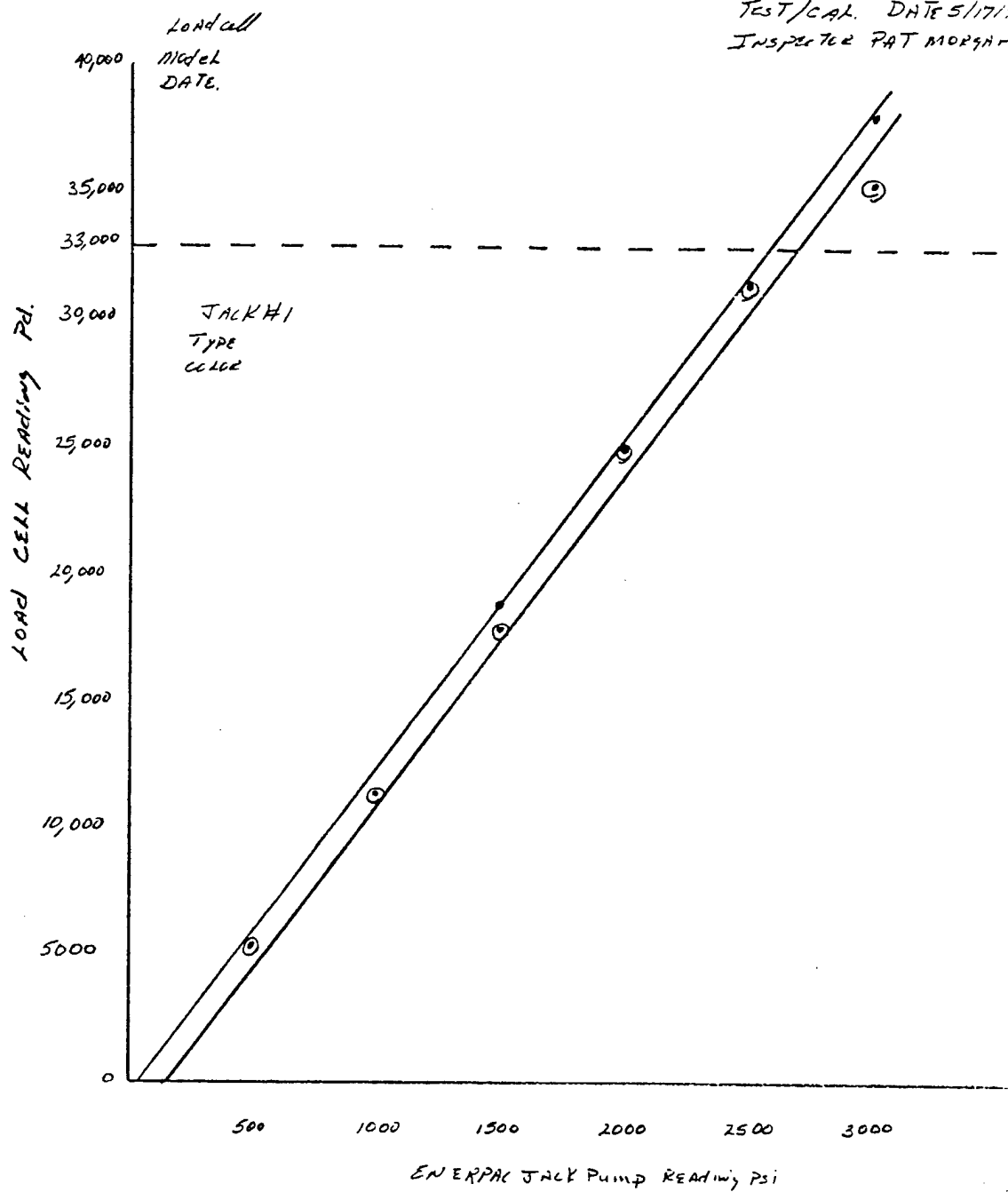


ENERPAC JACK PUMP READINGS - PSI

33 kip = 2800 psi

35 kip = 2950 psi

TEST/CAL. DATE 5/17/83  
INSPECTOR PAT MORRIS



ORD Form 427  
1 APR 83

33 Kip = 2650 PSI  
35 Kip = 2800 PSI  
★ U.S. GOVERNMENT PRINTING OFFICE : 1985-560-803

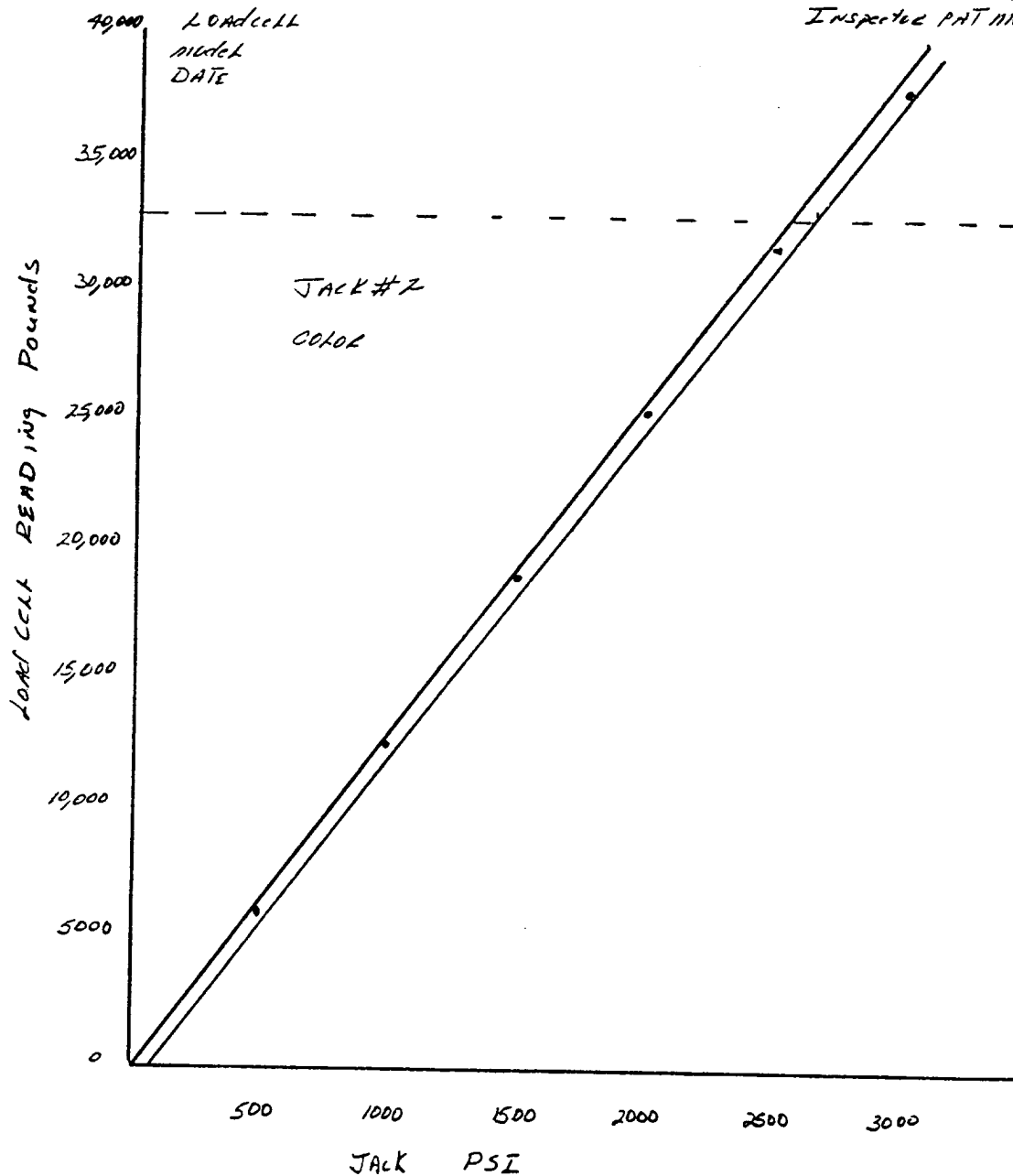


Corps of Engineers  
Ohio River Division

PROJECT: BRIDGE SHA STRESS JACK  
JACK # 2.

Page 2 of 2 Page  
Computed by Date  
Checked by Date

TEST/ENT DATE 5/11  
Inspector PAT MIDE



ORD Form 427  
1 APR 83

33 Kip = 2650  
35 Kip = 2800 psi  
★ U.S. GOVERNMENT PRINTING OFFICE: 1985-560-803

## WEEP HOLES

## GALLIPOLIS LOCKS

## LOCK LATERALS

## AUX. CHAMBER

LINE	HOLE	OPEN HOLE	CONCRETE DRILLED	ROCK DRILLED	TOTAL DEPTH
NO.	NO.	LN.FT.	LN.FT.	LN.FT.	LN.FT.
B	1	1.50	0.00	10.00	11.50
B	2	1.83	0.00	10.00	11.83
B	3	1.67	0.00	10.00	11.67
B	4	2.00	0.00	10.00	12.00
B	5	2.00	0.00	10.00	12.00
B	6	2.00	0.00	10.00	12.00
B	7	1.67	0.58	10.00	12.25
B	8	2.00	0.67	10.00	12.67
B	9	1.92	0.83	10.00	12.75
B	10	1.67	0.58	10.00	12.25
B	11	2.00	0.42	10.00	12.42
B	12	1.83	0.58	10.00	12.41
B	13	1.83	0.42	10.00	12.25
B	14	1.83	1.00	10.00	12.83
B	15	2.00	0.00	10.00	12.00
B	16	3.33	0.00	10.00	13.33
B	17	4.00	0.00	10.00	14.00
B	18	4.33	0.00	10.00	14.33
B	19	4.58	0.00	10.00	14.58
B	20	5.33	0.00	10.00	15.33
B	21	1.92	0.00	10.00	11.92
B	22	1.50	0.00	10.00	11.50
B	23	1.83	0.00	10.00	11.83
B	24	2.00	0.00	10.00	12.00
B	25	1.83	0.00	10.00	11.83
B	26	2.08	0.00	10.00	12.08
B	27	2.00	0.00	10.00	12.00
B	28	1.67	0.00	10.00	11.67
B	29	2.00	0.33	10.00	12.33
B	30	1.67	0.58	10.00	12.25
B	31	1.92	0.42	10.00	12.34
B	32	1.83	0.25	10.00	12.08
B	33	2.00	0.58	10.00	12.58
B	34	2.08	0.33	10.00	12.41
B	35	2.33	0.00	10.00	12.33
B	36	4.83	0.00	10.00	14.83
B	37	4.58	0.00	10.00	14.58
B	38	4.00	0.00	10.00	14.00
B	39	3.25	0.00	10.00	13.25
B	40	3.25	0.00	10.00	13.25
D	1	2.50	0.00	10.00	12.50
D	2	2.75	0.00	10.00	12.75
D	3	2.50	0.00	10.00	12.50

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

LINE	HOLE	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
NO.	NO.				
D	4	2.50	0.00	10.00	12.50
D	5	2.42	0.00	10.00	12.42
D	6	2.25	0.00	10.00	12.25
D	7	2.00	0.00	10.00	12.00
D	8	2.00	0.00	10.00	12.00
D	9	1.83	0.00	10.00	11.83
D	10	1.67	0.00	10.00	11.67
D	11	2.00	0.00	10.00	12.00
D	12	1.67	0.00	10.00	11.67
D	13	1.75	0.00	10.00	11.75
D	14	2.00	0.00	10.00	12.00
D	15	3.00	0.00	10.00	13.00
D	16	2.92	0.00	10.00	12.92
D	17	2.67	0.00	10.00	12.67
D	18	2.42	0.00	10.00	12.42
D	19	2.00	0.00	10.00	12.00
D	20	2.00	0.00	10.00	12.00
D	21	2.33	0.00	10.00	12.33
D	22	2.33	0.00	10.00	12.33
D	23	2.42	0.00	10.00	12.42
D	24	2.50	0.00	10.00	12.50
D	25	2.33	0.00	10.00	12.42
D	26	2.33	0.00	10.00	12.33
D	27	1.67	0.00	10.00	11.67
D	28	1.75	0.00	10.00	11.75
D	29	1.67	0.00	10.00	11.67
D	30	1.67	0.00	10.00	11.67
D	31	2.00	0.00	10.00	12.00
D	32	1.92	0.00	10.00	11.92
D	33	2.00	0.00	10.00	12.00
D	34	2.17	0.00	10.00	12.17
D	35	2.67	0.00	10.00	12.67
D	36	2.33	0.00	10.00	12.33
D	37	2.50	0.00	10.00	12.50
D	38	2.33	0.00	10.00	12.33
D	39	2.58	0.00	10.00	12.58
D	40	2.00	0.00	10.00	12.00
F	1	2.00	0.00	10.00	12.00
F	2	2.00	0.00	10.00	12.00
F	3	2.00	0.00	10.00	12.00
F	4	2.33	0.00	10.00	12.33
F	5	2.42	0.00	10.00	12.42
F	6	2.67	0.00	10.00	12.67

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

LINE NO.	HOLE NO.	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
F	7	2.00	0.00	10.00	12.00
F	8	2.17	0.00	10.00	12.17
F	9	2.00	0.00	10.00	12.00
F	10	2.00	0.00	10.00	12.00
F	11	1.83	0.00	10.00	11.83
F	12	2.00	0.00	10.00	12.00
F	13	1.83	0.00	10.00	11.83
F	14	2.00	0.00	10.00	12.00
F	15	2.17	0.00	10.00	12.17
F	16	3.00	0.00	10.00	13.00
F	17	2.17	0.00	10.00	12.17
F	18	2.25	0.00	10.00	12.25
F	19	2.17	0.00	10.00	12.17
F	20	2.17	0.00	10.00	12.17
F	21	2.17	0.00	10.00	12.17
F	22	2.17	0.00	10.00	12.17
F	23	2.17	0.00	10.00	12.17
F	24	2.17	0.00	10.00	12.17
F	25	2.33	0.00	10.00	12.33
F	26	2.75	0.00	10.00	12.75
F	27	1.92	0.00	10.00	11.92
F	28	1.83	0.00	10.00	11.83
F	29	1.75	0.00	10.00	11.75
F	30	1.58	0.00	10.00	11.58
F	31	1.50	0.00	10.00	11.50
F	32	1.33	0.00	10.00	11.33
F	33	1.83	0.00	10.00	11.83
F	34	2.25	0.00	10.00	12.25
F	35	2.33	0.00	10.00	12.33
F	36	2.25	0.00	10.00	12.25
F	37	2.33	0.00	10.00	12.33
F	38	2.25	0.00	10.00	12.25
F	39	2.33	0.00	10.00	12.33
F	40	2.33	0.00	10.00	12.33
H	1	2.25	0.00	10.00	12.25
H	2	2.67	0.00	10.00	12.67
H	3	2.58	0.00	10.00	12.58
H	4	2.25	0.00	10.00	12.25
H	5	2.42	0.00	10.00	12.42
H	6	3.42	0.00	10.00	13.42
H	7	2.50	0.00	10.00	12.50
H	8	2.25	0.00	10.00	12.25
H	9	2.17	0.00	10.00	12.17

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

=====						
: LINE :	: HOLE :	: OPEN :	: CONCRETE :	: ROCK :	: TOTAL :	
: NO. :	: NO. :	: HOLE :	: DRILLED :	: DRILLED :	: DEPTH :	
: NO. :	: NO. :	: LN.FT. :	: LN.FT. :	: LN.FT. :	: LN.FT. :	
=====						
: H :	10 :	2.17 :	0.00 :	10.00 :	12.17 :	
: H :	11 :	2.17 :	0.00 :	10.00 :	12.17 :	
: H :	12 :	2.42 :	0.00 :	10.00 :	12.42 :	
: H :	13 :	2.08 :	0.00 :	10.00 :	12.08 :	
: H :	14 :	2.00 :	0.00 :	10.00 :	12.00 :	
: H :	15 :	2.50 :	0.00 :	10.00 :	12.50 :	
: H :	16 :	2.58 :	0.00 :	10.00 :	12.58 :	
: H :	17 :	2.42 :	0.00 :	10.00 :	12.42 :	
: H :	18 :	2.92 :	0.00 :	10.00 :	12.92 :	
: H :	19 :	2.25 :	0.00 :	10.00 :	12.25 :	
: H :	20 :	2.25 :	0.00 :	10.00 :	12.25 :	
: H :	21 :	2.00 :	0.00 :	10.00 :	12.00 :	
: H :	22 :	2.42 :	0.00 :	10.00 :	12.42 :	
: H :	23 :	2.50 :	0.00 :	10.00 :	12.50 :	
: H :	24 :	1.83 :	0.00 :	10.00 :	11.83 :	
: H :	25 :	2.83 :	0.00 :	10.00 :	12.83 :	
: H :	26 :	3.00 :	0.00 :	10.00 :	13.00 :	
: H :	27 :	2.50 :	0.67 :	10.00 :	13.17 :	
: H :	28 :	2.42 :	0.42 :	10.00 :	12.84 :	
: H :	29 :	2.33 :	0.50 :	10.00 :	12.83 :	
: H :	30 :	2.33 :	0.42 :	10.00 :	12.75 :	
: H :	31 :	2.17 :	0.58 :	10.00 :	12.75 :	
: H :	32 :	2.08 :	0.92 :	10.00 :	13.00 :	
: H :	33 :	2.17 :	0.42 :	10.00 :	12.59 :	
: H :	34 :	2.25 :	0.42 :	10.00 :	13.67 :	
: H :	35 :	2.50 :	0.00 :	10.00 :	12.50 :	
: H :	36 :	2.67 :	0.00 :	10.00 :	12.67 :	
: H :	37 :	2.42 :	0.00 :	10.00 :	12.42 :	
: H :	38 :	2.42 :	0.00 :	10.00 :	12.42 :	
: H :	39 :	2.83 :	0.00 :	10.00 :	12.83 :	
: H :	40 :	2.25 :	0.00 :	10.00 :	12.25 :	
=====						
: J :	1 :	2.33 :	0.00 :	10.00 :	12.33 :	
: J :	2 :	2.33 :	0.00 :	10.00 :	12.33 :	
: J :	3 :	2.50 :	0.00 :	10.00 :	12.50 :	
: J :	4 :	2.67 :	0.00 :	10.00 :	12.67 :	
: J :	5 :	4.17 :	0.00 :	10.00 :	14.17 :	
: J :	6 :	3.00 :	0.00 :	10.00 :	13.00 :	
: J :	7 :	5.00 :	0.00 :	10.00 :	15.00 :	
: J :	8 :	2.17 :	0.42 :	10.00 :	12.59 :	
: J :	9 :	2.00 :	0.50 :	10.00 :	12.50 :	
: J :	10 :	2.33 :	0.33 :	10.00 :	12.66 :	
: J :	11 :	1.75 :	0.75 :	10.00 :	12.50 :	
: J :	12 :	2.17 :	0.42 :	10.00 :	12.59 :	

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

LINE	HOLE	OPEN HOLE	CONCRETE DRILLED	ROCK DRILLED	TOTAL DEPTH
NO.	NO.	LN.FT.	LN.FT.	LN.FT.	LN.FT.
J	13	2.17	0.58	10.00	12.75
J	14	2.17	0.33	10.00	12.50
J	15	2.92	0.00	10.00	12.92
J	16	3.17	0.00	10.00	13.17
J	17	3.00	0.00	10.00	13.00
J	18	2.83	0.00	10.00	12.83
J	19	2.50	0.00	10.00	12.50
J	20	2.75	0.00	10.00	12.75
J	21	2.75	0.00	10.00	12.75
J	22	2.92	0.00	10.00	12.92
J	23	2.83	0.00	10.00	12.82
J	24	3.00	0.00	10.00	13.00
J	25	3.00	0.00	10.00	13.00
J	26	3.00	0.00	10.00	13.00
J	27	1.92	0.92	10.00	12.84
J	28	2.00	0.58	10.00	12.58
J	29	2.17	0.42	10.00	12.59
J	30	1.83	0.67	10.00	12.50
J	31	2.00	0.50	10.00	12.50
J	32	2.17	0.50	10.00	12.67
J	33	2.08	0.58	10.00	12.66
J	34	2.83	0.00	10.00	12.83
J	35	2.83	0.00	10.00	12.83
J	36	2.50	0.00	10.00	12.50
J	37	2.83	0.00	10.00	12.83
J	38	2.67	0.00	10.00	12.67
J	39	2.33	0.00	10.00	12.33
J	40	2.75	0.00	10.00	12.75
=====					
L	1	4.17	0.00	10.00	14.17
L	2	1.50	1.75	10.00	13.25
L	3	1.75	1.50	10.00	13.25
L	4	1.67	1.67	10.00	13.34
L	5	1.67	1.67	10.00	13.34
L	6	1.50	1.17	10.00	12.67
L	7	2.00	0.67	10.00	12.67
L	8	2.67	0.00	10.00	12.67
L	9	1.00	1.00	10.00	12.00
L	10	2.00	0.00	10.00	12.00
L	11	1.75	0.33	10.00	12.08
L	12	1.75	0.33	10.00	12.08
L	13	2.00	0.58	10.00	12.58
L	14	2.08	0.58	10.00	12.66
L	15	2.08	0.58	10.00	12.66

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

=====						
: LINE :	: HOLE :	: OPEN :	: CONCRETE :	: ROCK :	: TOTAL :	
: NO. :	: NO. :	: HOLE :	: DRILLED :	: DRILLED :	: DEPTH :	
: NO. :	: NO. :	: LN.FT. :	: LN.FT. :	: LN.FT. :	: LN.FT. :	
=====						
: L :	16 :	1.75 :	0.67 :	10.00 :	12.42 :	
: L :	17 :	1.75 :	0.67 :	10.00 :	12.42 :	
: L :	18 :	1.83 :	0.67 :	10.00 :	12.50 :	
: L :	19 :	1.67 :	0.67 :	10.00 :	12.34 :	
: L :	20 :	1.83 :	0.75 :	10.00 :	12.58 :	
: L :	21 :	2.58 :	0.00 :	10.00 :	12.58 :	
: L :	22 :	1.00 :	1.67 :	10.00 :	12.67 :	
: L :	23 :	1.58 :	0.75 :	10.00 :	12.33 :	
: L :	24 :	1.75 :	0.75 :	10.00 :	12.50 :	
: L :	25 :	1.83 :	0.42 :	10.00 :	12.25 :	
: L :	26 :	1.92 :	0.50 :	10.00 :	12.42 :	
: L :	27 :	1.75 :	0.25 :	10.00 :	12.00 :	
: L :	28 :	1.33 :	1.00 :	10.00 :	12.33 :	
: L :	29 :	1.92 :	0.33 :	10.00 :	12.25 :	
: L :	30 :	1.83 :	0.50 :	10.00 :	12.33 :	
: L :	31 :	1.92 :	0.42 :	10.00 :	12.34 :	
: L :	32 :	1.83 :	0.58 :	10.00 :	12.41 :	
: L :	33 :	1.75 :	0.58 :	10.00 :	12.33 :	
: L :	34 :	1.75 :	0.58 :	10.00 :	12.33 :	
: L :	35 :	1.92 :	0.58 :	10.00 :	12.50 :	
: L :	36 :	1.50 :	0.92 :	10.00 :	12.42 :	
: L :	37 :	1.67 :	0.67 :	10.00 :	12.34 :	
: L :	38 :	1.75 :	0.42 :	10.00 :	12.17 :	
: L :	39 :	1.83 :	0.50 :	10.00 :	12.33 :	
: L :	40 :	1.83 :	0.67 :	10.00 :	12.50 :	
=====						
: N :	1 :	1.92 :	0.42 :	10.00 :	12.34 :	
: N :	2 :	1.92 :	0.42 :	10.00 :	12.34 :	
: N :	3 :	2.00 :	0.33 :	10.00 :	12.33 :	
: N :	4 :	2.00 :	0.25 :	10.00 :	12.25 :	
: N :	5 :	1.92 :	0.58 :	10.00 :	12.50 :	
: N :	6 :	1.83 :	1.50 :	10.00 :	13.33 :	
: N :	7 :	2.00 :	0.50 :	10.00 :	12.50 :	
: N :	8 :	2.00 :	0.42 :	10.00 :	12.42 :	
: N :	9 :	1.75 :	0.75 :	10.00 :	12.50 :	
: N :	10 :	1.92 :	0.92 :	10.00 :	12.84 :	
: N :	11 :	1.83 :	1.50 :	10.00 :	13.33 :	
: N :	12 :	1.83 :	3.00 :	10.00 :	14.83 :	
: N :	13 :	1.75 :	3.92 :	10.00 :	15.67 :	
: N :	14 :	2.17 :	4.33 :	10.00 :	16.50 :	
: N :	15 :	2.00 :	4.67 :	10.00 :	16.67 :	
: N :	16 :	1.92 :	3.33 :	10.00 :	15.25 :	
: N :	17 :	2.08 :	0.58 :	10.00 :	12.66 :	
: N :	18 :	2.17 :	0.58 :	10.00 :	12.75 :	

WEEP HOLES

GALLIPOLIS LOCKS

LOCK LATERALS

AUX. CHAMBER

LINE	HOLE	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
NO.	NO.				
N	19	2.17	0.42	10.00	12.59
N	20	1.83	1.00	10.00	12.83
N	21	1.75	1.25	10.00	13.00
N	22	1.67	1.33	10.00	13.00
N	23	1.50	1.58	10.00	13.08
N	24	1.67	1.50	10.00	13.17
N	25	1.50	1.67	10.00	13.17
N	26	1.92	0.42	10.00	12.34
N	27	1.92	1.58	10.00	13.50
N	28	1.83	1.92	10.00	13.75
N	29	2.00	1.83	10.00	13.83
N	30	1.92	2.17	10.00	14.09
N	31	1.92	2.75	10.00	14.67
N	32	1.83	2.67	10.00	14.50
N	33	1.58	4.00	10.00	15.58
N	34	2.00	3.42	10.00	15.42
N	35	1.92	3.83	10.00	15.75
N	36	1.75	3.08	10.00	14.83
N	37	2.00	0.50	10.00	12.50
N	38	1.67	0.50	10.00	12.17
N	39	1.83	0.33	10.00	12.16
N	40	1.83	1.17	10.00	13.00
P	1	1.83	0.50	10.00	12.33
P	2	1.83	0.50	10.00	12.33
P	3	1.92	0.83	10.00	12.75
P	4	1.92	0.25	10.00	12.17
P	5	1.58	0.42	10.00	12.00
P	6	1.67	0.50	10.00	12.17
P	7	1.67	1.83	10.00	13.50
P	8	1.92	0.42	10.00	12.34
P	9	1.50	0.67	10.00	12.17
P	10	1.83	0.58	10.00	12.41
P	11	1.75	0.42	10.00	12.17
P	12	2.00	0.17	10.00	12.17
P	13	2.00	0.25	10.00	12.25
P	14	1.50	0.50	10.00	12.00
P	15	1.67	0.50	10.00	12.17
P	16	1.67	2.00	10.00	13.67
P	17	2.17	2.33	10.00	14.50
P	18	1.92	3.33	10.00	15.25
P	19	1.92	3.08	10.00	15.00
P	20	1.92	2.50	10.00	14.42
P	21	1.67	0.75	10.00	12.42

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

LINE	HOLE	OPEN HOLE	CONCRETE DRILLED	ROCK DRILLED	TOTAL DEPTH
NO.	NO.	LN.FT.	LN.FT.	LN.FT.	LN.FT.
P	22	1.92	0.58	10.00	12.50
P	23	2.17	0.50	10.00	12.67
P	24	1.58	0.50	10.00	12.08
P	25	1.67	0.33	10.00	12.00
P	26	1.83	0.33	10.00	12.16
P	27	1.83	0.42	10.00	12.25
P	28	1.67	0.58	10.00	12.25
P	29	1.92	0.33	10.00	12.25
P	30	2.00	0.33	10.00	12.33
P	31	2.33	0.00	10.00	12.33
P	32	2.08	0.33	10.00	12.41
P	33	1.92	0.33	10.00	12.25
P	34	1.83	0.67	10.00	12.50
P	35	1.67	2.75	10.00	14.42
P	36	1.67	2.75	10.00	14.42
P	37	1.67	3.08	10.00	14.75
P	38	2.08	1.25	10.00	13.33
P	39	1.58	1.50	10.00	13.08
P	40	1.92	1.67	10.00	13.59
R	1	1.75	0.58	10.00	12.33
R	2	1.75	0.25	10.00	12.00
R	3	1.67	0.33	10.00	12.00
R	4	1.75	0.92	10.00	12.67
R	5	1.75	0.25	10.00	12.00
R	6	1.92	0.17	10.00	12.09
R	7	1.83	0.33	10.00	12.16
R	8	2.00	0.50	10.00	12.50
R	9	2.08	0.33	10.00	12.41
R	10	2.17	0.17	10.00	12.34
R	11	2.33	0.33	10.00	12.66
R	12	1.42	1.25	10.00	12.67
R	13	2.08	0.92	10.00	13.00
R	14	2.00	1.08	10.00	12.08
R	15	1.75	0.50	10.00	12.25
R	16	1.67	1.17	10.00	12.84
R	17	1.75	1.58	10.00	12.33
R	18	1.83	2.00	10.00	13.83
R	19	1.83	2.33	10.00	14.16
R	20	1.67	3.58	10.00	15.25
R	21	2.00	0.67	10.00	12.67
R	22	2.08	0.33	10.00	12.41
R	23	2.08	0.42	10.00	12.50
R	24	2.00	0.33	10.00	12.33

WEEP HOLES

GALLIPOLIS LOCKS

LOCK LATERALS

AUX. CHAMBER

=====						
: LINE :	HOLE :	OPEN :	CONCRETE :	ROCK :	TOTAL :	
: NO. :	NO. :	HOLE :	DRILLED :	DRILLED :	DEPTH :	
: NO. :	NO. :	LN.FT. :	LN.FT. :	LN.FT. :	LN.FT. :	
=====						
: R :	25 :	1.75 :	0.67 :	10.00 :	12.42 :	
: R :	26 :	2.17 :	0.17 :	10.00 :	12.34 :	
: R :	27 :	2.25 :	0.17 :	10.00 :	12.42 :	
: R :	28 :	2.42 :	0.33 :	10.00 :	12.75 :	
: R :	29 :	2.50 :	0.33 :	10.00 :	12.83 :	
: R :	30 :	2.50 :	0.25 :	10.00 :	12.75 :	
: R :	31 :	2.58 :	0.25 :	10.00 :	12.83 :	
: R :	32 :	1.83 :	0.25 :	10.00 :	12.08 :	
: R :	33 :	1.83 :	0.17 :	10.00 :	12.00 :	
: R :	34 :	2.17 :	0.33 :	10.00 :	12.50 :	
: R :	35 :	2.00 :	0.67 :	10.00 :	12.67 :	
: R :	36 :	1.92 :	0.83 :	10.00 :	12.75 :	
: R :	37 :	1.75 :	0.92 :	10.00 :	13.67 :	
: R :	38 :	1.67 :	2.33 :	10.00 :	14.00 :	
: R :	39 :	1.83 :	2.83 :	10.00 :	14.66 :	
: R :	40 :	1.75 :	3.42 :	10.00 :	15.17 :	
: =====:	=====:	=====:	=====:	=====:	=====:	
: T :	1 :	1.67 :	0.33 :	10.00 :	12.00 :	
: T :	2 :	1.50 :	0.67 :	10.00 :	12.17 :	
: T :	3 :	1.75 :	0.42 :	10.00 :	12.17 :	
: T :	4 :	2.00 :	0.42 :	10.00 :	12.42 :	
: T :	5 :	2.08 :	0.50 :	10.00 :	12.58 :	
: T :	6 :	1.83 :	0.67 :	10.00 :	12.50 :	
: T :	7 :	2.17 :	0.33 :	10.00 :	12.50 :	
: T :	8 :	2.50 :	0.50 :	10.00 :	13.00 :	
: T :	9 :	2.25 :	0.75 :	10.00 :	13.00 :	
: T :	10 :	2.25 :	0.92 :	10.00 :	13.17 :	
: T :	11 :	2.33 :	0.83 :	10.00 :	13.16 :	
: T :	12 :	2.25 :	0.50 :	10.00 :	12.75 :	
: T :	13 :	2.08 :	0.42 :	10.00 :	12.50 :	
: T :	14 :	1.83 :	0.83 :	10.00 :	12.66 :	
: T :	15 :	1.92 :	0.92 :	10.00 :	12.84 :	
: T :	16 :	1.83 :	0.67 :	10.00 :	12.50 :	
: T :	17 :	1.75 :	0.92 :	10.00 :	12.67 :	
: T :	18 :	1.75 :	1.25 :	10.00 :	13.00 :	
: T :	19 :	1.75 :	1.58 :	10.00 :	13.33 :	
: T :	20 :	1.92 :	0.25 :	10.00 :	12.17 :	
: T :	21 :	1.50 :	0.50 :	10.00 :	12.00 :	
: T :	22 :	1.83 :	0.42 :	10.00 :	12.25 :	
: T :	23 :	1.92 :	0.67 :	10.00 :	12.59 :	
: T :	24 :	1.58 :	1.00 :	10.00 :	12.58 :	
: T :	25 :	1.83 :	1.08 :	10.00 :	12.91 :	
: T :	26 :	1.92 :	0.25 :	10.00 :	12.17 :	
: T :	27 :	1.50 :	0.50 :	10.00 :	12.00 :	

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

LINE NO.	HOLE NO.	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
T	28	1.75	0.92	10.00	12.67
T	29	2.25	0.58	10.00	12.83
T	30	2.42	0.33	10.00	12.75
T	31	2.42	0.33	10.00	12.75
T	32	2.50	0.42	10.00	12.92
T	33	2.33	0.33	10.00	12.66
T	34	2.17	0.42	10.00	12.59
T	35	1.83	0.83	10.00	12.66
T	36	1.75	1.00	10.00	12.75
T	37	1.67	1.00	10.00	12.67
T	38	1.67	1.50	10.00	13.17
T	39	1.67	2.17	10.00	13.84
T	40	1.58	3.33	10.00	14.91
V	1	2.00	0.25	10.00	12.25
V	2	2.00	0.25	10.00	12.25
V	3	1.92	0.58	10.00	12.50
V	4	1.67	0.42	10.00	12.09
V	5	1.92	0.33	10.00	12.25
V	6	1.75	0.50	10.00	12.25
V	7	2.00	0.33	10.00	12.33
V	8	1.17	0.92	10.00	12.09
V	9	2.50	0.42	10.00	12.92
V	10	2.50	0.58	10.00	13.08
V	11	2.00	1.08	10.00	13.08
V	12	2.50	0.33	10.00	12.83
V	13	2.67	0.25	10.00	12.92
V	14	2.58	0.25	10.00	12.83
V	15	1.83	0.50	10.00	12.33
V	16	1.75	0.75	10.00	12.50
V	17	1.75	0.75	10.00	12.50
V	18	1.83	1.25	10.00	13.08
V	19	1.75	3.25	10.00	14.00
V	20	1.83	2.33	10.00	14.16
V	21	1.67	2.17	10.00	13.84
V	22	1.92	0.42	10.00	12.34
V	23	2.08	0.25	10.00	12.33
V	24	2.00	0.67	10.00	12.67
V	25	2.08	0.58	10.00	12.66
V	26	2.33	0.17	10.00	12.50
V	27	2.42	0.17	10.00	12.59
V	28	2.67	0.42	10.00	13.09
V	29	2.67	0.67	10.00	13.34
V	30	2.50	0.75	10.00	13.50

# WEEP HOLES

## GALLIPOLIS LOCKS

### LOCK LATERALS

### AUX. CHAMBER

LINE NO.	HOLE NO.	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
V	31	2.67	0.42	10.00	13.09
V	32	2.50	0.33	10.00	12.83
V	33	2.33	0.25	10.00	12.58
V	34	2.50	0.17	10.00	12.67
V	35	1.92	0.33	10.00	12.25
V	36	1.92	0.42	10.00	12.34
V	37	1.83	1.17	10.00	13.00
V	38	1.83	1.50	10.00	13.33
V	39	1.92	1.92	10.00	13.84
V	40	1.50	2.67	10.00	14.17
X	1	2.25	0.42	10.00	12.67
X	2	2.17	0.17	10.00	12.34
X	3	1.92	0.42	10.00	12.34
X	4	1.92	0.50	10.00	12.42
X	5	1.83	0.33	10.00	12.16
X	6	2.00	0.67	10.00	12.67
X	7	2.58	0.25	10.00	12.83
X	8	2.42	0.50	10.00	12.92
X	9	2.50	0.25	10.00	12.75
X	10	2.33	0.33	10.00	12.66
X	11	2.50	0.33	10.00	12.83
X	12	2.42	0.42	10.00	12.84
X	13	2.42	0.25	10.00	12.67
X	14	1.92	0.92	10.00	12.84
X	15	1.92	0.75	10.00	12.67
X	16	2.42	0.50	10.00	12.92
X	17	1.83	0.58	10.00	12.41
X	18	1.83	0.50	10.00	12.33
X	19	1.83	0.50	10.00	12.33
X	20	1.75	0.25	10.00	12.00
X	21	1.75	0.58	10.00	12.33
X	22	1.92	0.58	10.00	12.50
X	23	1.92	0.58	10.00	12.50
X	24	1.75	0.67	10.00	12.42
X	25	2.17	0.33	10.00	12.50
X	26	2.08	0.42	10.00	12.50
X	27	2.17	1.17	10.00	13.34
X	28	3.00	0.25	10.00	13.25
X	29	2.67	0.33	10.00	13.00
X	30	2.50	0.50	10.00	13.00
X	31	2.33	0.58	10.00	12.91
X	32	2.50	0.33	10.00	12.83
X	33	2.58	0.17	10.00	12.75

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK LATERALS  
AUX. CHAMBER

LINE	HOLE	OPEN HOLE	CONCRETE DRILLED	ROCK DRILLED	TOTAL DEPTH
NO.	NO.	LN.FT.	LN.FT.	LN.FT.	LN.FT.
X	34	3.00	0.00	10.00	13.00
X	35	2.58	0.25	10.00	12.83
X	36	2.50	0.17	10.00	12.67
X	37	1.92	0.33	10.00	12.25
X	38	1.83	0.50	10.00	12.33
X	39	1.83	1.33	10.00	13.66
X	40	1.92	0.42	10.00	12.34
TOTALS		1,019.8	268.9	4,800.0	6,088.5

WEEP HOLES  
GALLIPOLIS LOCKS

LOCK FLOOR

AUX. CHAMBER

LINE NO.	HOLE NO.	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
I	2	2.00	1.17	10.00	13.17
I	3	2.17	0.92	10.00	13.09
I	5	2.17	0.42	10.00	12.59
I	6	2.25	0.42	10.00	12.67
I	7	1.92	0.58	10.00	12.50
I	9	2.00	0.42	10.00	12.42
I	10	3.00	0.00	10.00	13.00
I	11	3.00	0.00	10.00	13.00
I	12	3.00	0.00	10.00	13.00
I	14	2.42	0.33	10.00	12.75
I	15	2.25	0.58	10.00	12.83
I	17	5.00	0.00	10.00	15.00
J	2	2.50	0.67	10.00	13.17
J	3	1.92	1.42	10.00	13.34
J	5	1.83	0.83	10.00	12.66
J	6	2.00	0.67	10.00	12.67
J	7	2.25	0.42	10.00	12.67
J	9	2.25	0.50	10.00	12.75
J	10	3.00	0.00	10.00	13.00
J	11	3.00	0.00	10.00	13.00
J	12	3.00	0.00	10.00	13.00
J	14	2.33	0.50	10.00	12.83
J	15	2.00	0.67	10.00	12.67
J	17	4.00	0.00	10.00	14.00
K	2	2.33	0.00	10.00	12.33
K	3	2.67	0.67	10.00	13.34
K	5	1.33	0.83	10.00	12.16
K	6	2.00	0.92	10.00	12.92
K	7	2.00	0.58	10.00	12.58
K	9	2.42	0.33	10.00	12.75
K	10	3.00	0.00	10.00	13.00
K	11	3.00	0.00	10.00	13.00
K	12	3.00	0.00	10.00	13.00
K	14	2.42	0.58	10.00	13.00
K	15	1.83	1.17	10.00	13.00
K	17	4.00	0.00	10.00	14.00
L	1	3.75	0.00	10.00	13.75
L	2	3.50	0.00	10.00	13.50
L	3	3.21	0.00	10.00	13.21
L	4	2.92	0.00	10.00	12.92
L	5	2.75	0.00	10.00	12.75

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK FLOOR  
AUX. CHAMBER

=====						
: LINE :	HOLE :	OPEN :	CONCRETE :	ROCK :	TOTAL :	
: NO. :	NO. :	HOLE :	DRILLED :	DRILLED :	DEPTH :	
: NO. :	NO. :	LN.FT.:	LN.FT. :	LN.FT. :	LN.FT. :	
=====						
: L :	6 :	2.67 :	0.00 :	10.00 :	12.67 :	
: L :	7 :	2.46 :	0.00 :	10.00 :	12.46 :	
: L :	8 :	2.50 :	0.00 :	10.00 :	12.50 :	
: L :	9 :	2.50 :	0.00 :	10.00 :	12.50 :	
: L :	10 :	3.00 :	0.00 :	10.00 :	13.00 :	
: L :	11 :	3.08 :	0.00 :	10.00 :	13.08 :	
: L :	12 :	2.83 :	0.00 :	10.00 :	12.83 :	
: L :	13 :	2.75 :	0.00 :	10.00 :	12.75 :	
: L :	14 :	2.67 :	0.00 :	10.00 :	12.67 :	
: L :	15 :	3.00 :	0.00 :	10.00 :	13.00 :	
: L :	16 :	2.92 :	0.00 :	10.00 :	12.92 :	
: L :	17 :	2.75 :	0.00 :	10.00 :	12.75 :	
=====						
: M :	1 :	3.75 :	0.00 :	10.00 :	13.75 :	
: M :	2 :	3.50 :	0.00 :	10.00 :	13.50 :	
: M :	3 :	3.25 :	0.00 :	10.00 :	13.25 :	
: M :	4 :	3.33 :	0.00 :	10.00 :	13.33 :	
: M :	5 :	2.75 :	0.00 :	10.00 :	12.75 :	
: M :	6 :	2.88 :	0.00 :	10.00 :	12.88 :	
: M :	7 :	2.67 :	0.00 :	10.00 :	12.67 :	
: M :	8 :	2.33 :	0.00 :	10.00 :	12.33 :	
: M :	9 :	2.42 :	0.00 :	10.00 :	12.42 :	
: M :	10 :	2.75 :	0.00 :	10.00 :	12.75 :	
: M :	11 :	3.33 :	0.00 :	10.00 :	13.33 :	
: M :	12 :	2.88 :	0.00 :	10.00 :	12.88 :	
: M :	13 :	2.67 :	0.00 :	10.00 :	12.67 :	
: M :	14 :	2.67 :	0.00 :	10.00 :	12.67 :	
: M :	15 :	2.75 :	0.00 :	10.00 :	12.75 :	
: M :	16 :	2.83 :	0.00 :	10.00 :	12.83 :	
: M :	17 :	2.97 :	0.00 :	10.00 :	12.97 :	
=====						
: N :	1 :	3.17 :	0.00 :	10.00 :	13.17 :	
: N :	2 :	3.00 :	0.00 :	10.00 :	13.00 :	
: N :	3 :	2.92 :	0.00 :	10.00 :	12.92 :	
: N :	4 :	3.00 :	0.00 :	10.00 :	13.00 :	
: N :	5 :	3.00 :	0.00 :	10.00 :	13.00 :	
: N :	6 :	2.85 :	0.00 :	10.00 :	12.85 :	
: N :	7 :	2.46 :	0.00 :	10.00 :	12.46 :	
: N :	8 :	2.25 :	0.00 :	10.00 :	12.25 :	
: N :	9 :	2.50 :	0.00 :	10.00 :	12.50 :	
: N :	10 :	2.92 :	0.00 :	10.00 :	12.92 :	
: N :	11 :	2.75 :	0.00 :	10.00 :	12.75 :	
: N :	12 :	3.08 :	0.00 :	10.00 :	13.08 :	
: N :	13 :	2.75 :	0.00 :	10.00 :	12.75 :	

WEEP HOLES  
GALLIPOLIS LOCKS

LOCK FLOOR

AUX. CHAMBER

LINE NO.	HOLE NO.	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
N	14	2.75	0.00	10.00	12.75
N	15	2.83	0.00	10.00	12.83
N	16	2.75	0.00	10.00	12.75
N	17	3.83	0.00	10.00	13.83
O	1	3.67	0.00	10.00	13.67
O	2	2.88	0.00	10.00	12.88
O	3	2.50	0.00	10.00	12.50
O	4	2.79	0.00	10.00	12.79
O	5	2.75	0.00	10.00	12.75
O	6	2.63	0.00	10.00	12.63
O	7	2.42	0.00	10.00	12.42
O	8	2.33	0.00	10.00	12.33
O	9	2.42	0.00	10.00	12.42
O	10	2.75	0.00	10.00	12.75
O	11	3.00	0.00	10.00	13.00
O	12	2.92	0.00	10.00	12.92
O	13	2.75	0.00	10.00	12.75
O	14	2.67	0.00	10.00	12.67
O	15	2.67	0.00	10.00	12.67
O	16	2.92	0.00	10.00	12.92
O	17	2.42	0.00	10.00	12.42
P	1	3.79	0.00	10.00	13.79
P	2	3.54	0.00	10.00	13.54
P	3	2.92	0.00	10.00	12.92
P	4	2.33	0.00	10.00	12.33
P	5	2.67	0.00	10.00	12.67
P	6	2.58	0.00	10.00	12.58
P	7	2.42	0.00	10.00	12.42
P	8	2.33	0.00	10.00	12.33
P	9	2.50	0.00	10.00	12.50
P	10	2.75	0.00	10.00	12.75
P	11	2.75	0.00	10.00	12.75
P	12	3.00	0.00	10.00	13.00
P	13	2.75	0.00	10.00	12.75
P	14	2.17	0.00	10.00	12.17
P	15	3.33	0.00	10.00	13.33
P	16	3.33	0.00	10.00	13.33
P	17	4.38	0.00	10.00	14.38
Q	1	3.63	0.00	10.00	13.63
Q	2	3.46	0.00	10.00	13.46
Q	3	3.42	0.00	10.00	13.42

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK FLOOR  
AUX. CHAMBER

LINE	HOLE	OPEN HOLE	CONCRETE DRILLED	ROCK DRILLED	TOTAL DEPTH
NO.	NO.	LN.FT.	LN.FT.	LN.FT.	LN.FT.
Q	4	3.17	0.00	10.00	13.17
Q	5	2.88	0.00	10.00	12.88
Q	6	2.54	0.00	10.00	12.54
Q	7	2.58	0.00	10.00	12.58
Q	8	2.50	0.00	10.00	12.50
Q	9	2.67	0.00	10.00	12.67
Q	10	2.75	0.00	10.00	12.75
Q	11	3.00	0.00	10.00	13.00
Q	12	2.92	0.00	10.00	12.92
Q	13	2.75	0.00	10.00	12.75
Q	14	2.92	0.00	10.00	12.92
Q	15	3.83	0.00	10.00	13.83
Q	16	3.08	0.00	10.00	13.08
Q	17	4.50	0.00	10.00	14.50
=====					
R	1	4.29	0.00	10.00	14.29
R	2	3.96	0.00	10.00	13.96
R	3	3.29	0.00	10.00	13.29
R	4	2.75	0.00	10.00	12.75
R	5	2.92	0.00	10.00	12.92
R	6	3.42	0.00	10.00	13.42
R	7	3.58	0.00	10.00	13.58
R	8	3.75	0.00	10.00	13.75
R	9	3.08	0.00	10.00	13.08
R	10	3.58	0.00	10.00	13.58
R	11	4.42	0.00	10.00	14.42
=====					
S	1	3.67	0.00	10.00	13.67
S	2	4.42	0.00	10.00	14.42
S	3	3.42	0.00	10.00	13.42
S	4	4.50	0.00	10.00	14.50
S	5	3.75	0.00	10.00	13.75
S	6	4.54	0.00	10.00	14.54
=====					
TOTALS		451.0	15.60	1,550.0	2,016.63
=====					

WEEP HOLES  
GALLIPOLIS LOCKS

LOCK FLOOR

MAIN CHAMBER

LINE NO.	HOLE NO.	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
A	1	4.88	0.00	10.00	14.88
A	2	2.33	0.00	10.00	12.33
A	3	2.54	0.00	10.00	12.54
A	4	2.67	0.00	10.00	12.67
A	5	3.00	0.00	10.00	13.00
A	6	2.79	0.00	10.00	12.79
A	7	2.67	0.00	10.00	12.67
A	8	2.29	0.00	10.00	12.29
A	9	2.38	0.00	10.00	12.38
A	10	2.42	0.00	10.00	12.42
A	11	2.88	0.00	10.00	12.88
A	12	3.00	0.00	10.00	13.00
A	13	2.71	0.00	10.00	12.71
A	14	2.83	0.00	10.00	12.83
A	15	2.17	0.00	10.00	12.17
A	16	2.00	0.00	10.00	12.00
A	17	1.92	0.00	10.00	11.92
B	1	4.67	0.00	10.00	14.67
B	2	2.38	0.00	10.00	12.38
B	3	2.38	0.00	10.00	12.38
B	4	2.58	0.00	10.00	12.58
B	5	3.08	0.00	10.00	13.08
B	6	2.50	0.00	10.00	12.50
B	7	2.46	0.00	10.00	12.46
B	8	2.42	0.00	10.00	12.42
B	9	2.33	0.00	10.00	12.33
B	10	2.42	0.00	10.00	12.42
B	11	2.75	0.00	10.00	12.75
B	12	2.75	0.00	10.00	12.75
B	13	2.50	0.00	10.00	12.50
B	14	2.33	0.00	10.00	12.33
B	15	1.79	0.00	10.00	11.79
B	16	1.79	0.00	10.00	11.79
B	17	1.75	0.00	10.00	11.75
C	1	4.58	0.00	10.00	14.58
C	2	2.42	0.00	10.00	12.42
C	3	2.33	0.00	10.00	12.33
C	4	2.33	0.00	10.00	12.33
C	5	2.83	0.00	10.00	12.83
C	6	2.75	0.00	10.00	12.75
C	7	2.88	0.00	10.00	12.88
C	8	2.83	0.00	10.00	12.83

WEEP HOLES  
GALLIPOLIS LOCKS

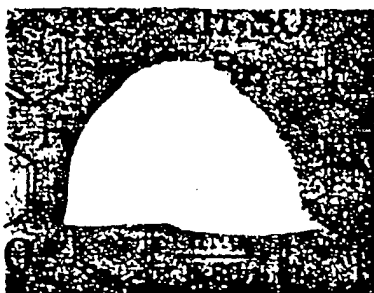
LOCK FLOOR

MAIN CHAMBER

=====						
LINE	HOLE	OPEN	CONCRETE	ROCK	TOTAL	
NO.	NO.	HOLE	DRILLED	DRILLED	DEPTH	
		LN.FT.	LN.FT.	LN.FT.	LN.FT.	
=====						
C	9	2.42	0.00	10.00	12.42	
C	10	2.92	0.00	10.00	12.92	
C	11	2.92	0.00	10.00	12.92	
C	12	2.88	0.00	10.00	12.88	
C	13	2.50	0.00	10.00	12.50	
C	14	2.67	0.00	10.00	12.67	
C	15	2.25	0.00	10.00	12.25	
C	16	2.13	0.00	10.00	12.13	
C	17	2.79	0.00	10.00	12.79	
=====						
D	1	3.67	0.00	10.00	13.67	
D	2	2.67	0.00	10.00	12.67	
D	3	2.08	0.00	10.00	12.08	
D	4	2.08	0.00	10.00	12.08	
D	5	3.13	0.00	10.00	13.13	
D	6	2.63	0.00	10.00	12.63	
D	7	2.54	0.00	10.00	12.54	
D	8	2.58	0.00	10.00	12.58	
D	9	2.56	0.00	10.00	12.56	
D	10	2.58	0.00	10.00	12.58	
D	11	2.58	0.00	10.00	12.58	
D	12	2.63	0.00	10.00	12.63	
D	13	2.67	0.00	10.00	12.67	
D	14	1.79	0.00	10.00	11.79	
D	15	1.79	0.00	10.00	11.79	
D	16	1.83	0.00	10.00	11.83	
D	17	1.92	0.00	10.00	11.92	
=====						
E	1	4.38	0.00	10.00	14.38	
E	2	2.75	0.00	10.00	12.75	
E	3	2.29	0.00	10.00	12.29	
E	4	2.17	0.00	10.00	12.17	
E	5	2.42	0.00	10.00	12.42	
E	6	2.88	0.00	10.00	12.88	
E	7	2.83	0.00	10.00	12.83	
E	8	2.42	0.00	10.00	12.42	
E	9	2.33	0.00	10.00	12.33	
E	10	2.38	0.00	10.00	12.38	
E	11	3.00	0.00	10.00	13.00	
E	12	2.20	0.00	10.00	12.20	
E	13	1.79	0.00	10.00	11.79	
E	14	1.75	0.00	10.00	11.75	
E	15	2.00	0.00	10.00	12.00	
E	16	1.83	0.00	10.00	11.83	

WEEP HOLES  
GALLIPOLIS LOCKS  
LOCK FLOOR  
MAIN CHAMBER

LINE NO.	HOLE NO.	OPEN HOLE LN.FT.	CONCRETE DRILLED LN.FT.	ROCK DRILLED LN.FT.	TOTAL DEPTH LN.FT.
E	17	2.04	0.00	10.00	12.04
F	1	4.29	0.00	10.00	14.29
F	2	2.25	0.00	10.00	12.25
F	3	2.25	0.00	10.00	12.25
F	4	2.29	0.00	10.00	12.29
F	5	2.67	0.00	10.00	12.67
F	6	2.75	0.00	10.00	12.75
F	7	2.46	0.00	10.00	12.46
F	8	2.33	0.00	10.00	12.33
F	9	2.42	0.00	10.00	12.42
F	10	2.21	0.00	10.00	12.21
F	11	3.08	0.00	10.00	13.08
F	12	3.08	0.00	10.00	13.08
F	13	1.83	0.00	10.00	11.83
F	14	1.83	0.00	10.00	11.83
F	15	1.92	0.00	10.00	11.92
F	16	1.83	0.00	10.00	11.83
F	17	2.29	0.00	10.00	12.29
G	1	4.75	0.00	10.00	14.75
G	2	2.50	0.00	10.00	12.50
G	3	2.08	0.00	10.00	12.08
G	4	2.42	0.00	10.00	12.42
G	5	2.42	0.00	10.00	12.42
G	6	2.42	0.00	10.00	12.42
G	7	2.08	0.00	10.00	12.08
G	8	1.83	0.00	10.00	11.83
G	9	1.83	0.00	10.00	11.83
G	10	1.96	0.00	10.00	11.96
G	11	N/A	N/A	N/A	N/A
G	12	2.67	0.00	10.00	12.67
H	1	4.83	0.00	10.00	14.83
H	2	2.67	0.00	10.00	12.67
H	3	2.42	0.00	10.00	12.42
H	4	3.13	0.00	10.00	13.13
H	5	3.92	0.00	10.00	13.92
TOTALS		303.69	0.00	1,180.0	1,483.69



# AEROSPRAY<sup>®</sup> 70

*binder*

PRODUCT BULLETIN EN 1008

AEROSPRAY<sup>®</sup> 70 binder is the latest development in polymeric soil stabilizers and dust control agents. It functions to reduce and eliminate surface erosion caused by wind and rain. At low treatment levels, AEROSPRAY 70 binder works as an effective binding agent which also forms a surface film coating when used in higher concentrations.

## Advantages

- **EXCELLENT RESULTS -**  
Stabilizes surface soil and prevents erosion by wind and rain while leaving the esthetic appearance of the treated area unaffected.
- **ECONOMICAL -**  
AEROSPRAY 70 binder controls dust in areas of light traffic without the need for costly surface treatments.
- **STABLE -**  
Extremely resistant to sunlight and completely safe for both germinating and growing plants.
- **EASY TO USE & SAFE TO HANDLE -**  
AEROSPRAY 70 presents no fire or explosion hazards either in storage or during application.

## Principal Uses

AEROSPRAY 70 binder has been proved effective in a wide range of stabilization problems on several types of soils and mine tailings under varying environmental conditions. Some areas where AEROSPRAY 70 binder might be used effectively include:

### Agriculture

- As a binder to prevent erosion during seed germination in establishment of vegetative cover.
- To prevent damage to seedlings by dust blown from adjacent locations.

### Aviation

- The suppression of dust on the perimeter areas of runways and taxiways.
- Used in conjunction with the construction of runways, taxiways, and hanger ramps at secondary airports.

CYANAMID

ENGINEERING CHEMICALS, AMERICAN CYANAMID COMPANY, WAYNE, NEW JERSEY 07470

#### Conservation

- Sand dune stabilization.
- Dust suppression.
- Erosion control.

#### Construction

- Dust suppression on job sites.
- To complement road construction.
- As a binder for both seeds and hay mulch on newly graded slopes and roadway embankments.

#### The Home

- As an aid in establishing lawns by preventing seed bed erosion during germination, especially in high slope areas.
- The construction of walkways.

#### Mining

- The stabilization of tailings piles to control environmental pollution.
- To minimize the losses incurred in transporting crushed coal, or ore in open vehicles; such as, railroad cars, trucks, and ships, etc., by binding the exposed surface.

#### Water Management

- Water catchments.
- Pond liners.
- Irrigation ditch liners.

## Typical Properties

AEROSPRAY 70 binder is supplied in concentrated form, and requires only dilution with water in the field to the desired level for application. Typical properties of AEROSPRAY 70 binder as supplied are:

Appearance .....	Milky-white, viscous liquid
Film .....	Colorless, transparent, non-reemulsifiable
Total Solids .....	60 $\pm$ 1% by weight
Average Weight per Gallon at 20°C. ....	9.25 lb.
pH at 25°C. ....	4 to 6
Viscosity, Brookfield No. 4 spindle at 60 rpm. ....	1,800 to 3,800 cps.
Storage Stability .....	Excellent; avoid prolonged storage temperatures above 110°F. or exposure to freezing (32°F.)
Dilution Stability. ....	Excellent

# AEROSPRAY 70 binder

The binding and film forming properties of AEROSPRAY 70 binder result from the coalescing of the polymer particles as the water is lost by evaporation into the air, or by absorption into the surrounding substrate matrix. Drying time is dependent upon several factors, including the dilution ratio, application rate, and environmental conditions such as wind velocity, temperature and relative humidity. It can range from twenty minutes to several hours. To achieve optimum results, AEROSPRAY 70 should not be applied when the soil temperature is lower than about 45°F.

AEROSPRAY 70 will provide a coating that can be made to vary from a tough continuous surface film of polymer to an almost imperceptible web of microscopic threads which fill the interstitial voids in the soil matrix, literally tying the particles together. The characteristics of the coating are dependent upon several things; primarily

the dilution ratio and application rate of AEROSPRAY 70 binder and the degree of compaction and particle size distribution of the substrate.

## Binding

When AEROSPRAY 70 binder is mixed with 1 part or more of water and applied to non-compacted substrates similar to sand, no surface film will be formed. Instead, the mixture will penetrate into the matrix and bind the individual particles. Experience has shown that the depth of penetration is more dependent upon the quantity of solution applied rather than its concentration. Figure 1 illustrates this for solutions of AEROSPRAY 70 binder and water ranging from 1 part AEROSPRAY 70 binder in 1 part water to 1 part AEROSPRAY 70 binder in 20 parts water. The mixtures in the example were applied to a sandy silt extracted from lower New York Bay.

FIGURE 1  
PENETRATION OF AEROSPRAY 70 BINDER IN PORT ELIZABETH, N.J., SOIL

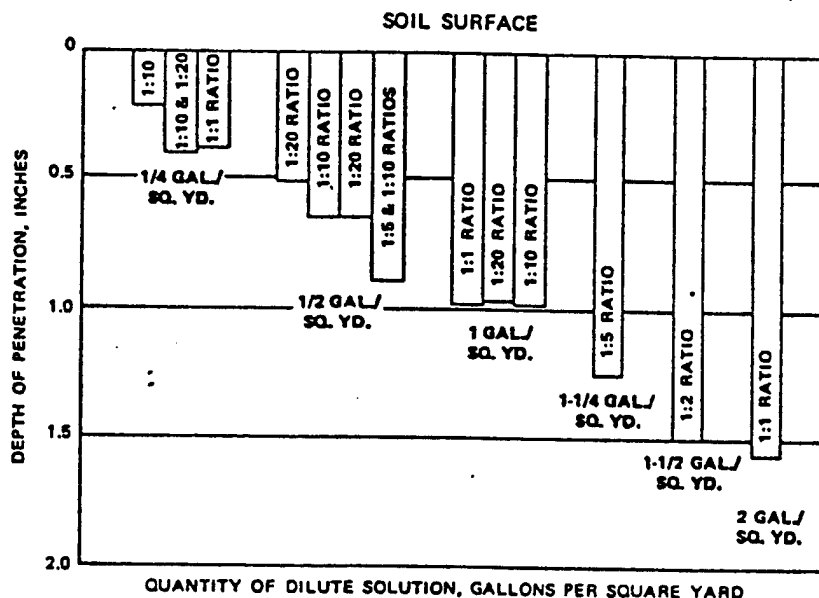
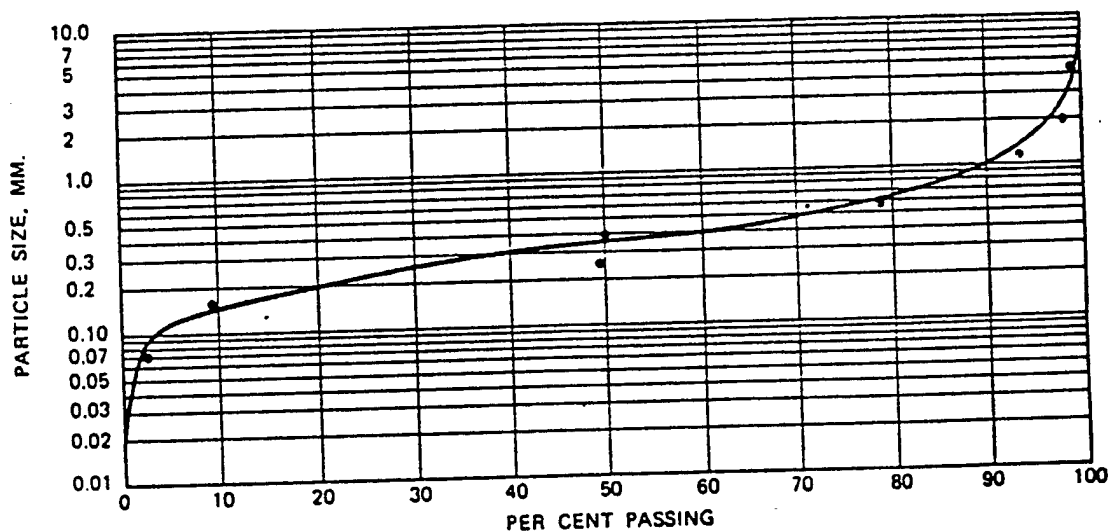


Figure 2 shows the distribution of particle sizes in the test soil. Information about the structure of the substrate to which the AEROSPRAY 70 will be applied is helpful in determining optimum application rates, because results are heavily dependent on the substrate characteristics. An increase in the proportion of larger particles, as for example, in coarse sand, would result in greater penetration for a given quantity of AEROSPRAY 70 binder. Where there are greater percentages of fine particles, as in soils rich in clay, penetration is reduced. Under these conditions, AEROSPRAY 70 binder will form a surface film with very little penetration when applied in a solution of 1, 2, or more parts AEROSPRAY 70 binder to 1 part water, as described above.

The strength of the layer of bound soil will increase with increasing AEROSPRAY 70 binder concentration for a fixed application rate. The permeability of the treated soil will decrease. This is because of the manner in which AEROSPRAY 70 binder performs its

function in dilute mixtures. The individual soil particles are laced together by a web of polymeric bridges. As the quantity of AEROSPRAY 70 binder is increased, the network of bridges becomes more intricate, until all the voids in the soil matrix are filled with the polymer. The desirability or undesirability of completely filling all of the void space in a given substrate layer will, of course, depend upon the cost-performance objectives of the particular application. In the stabilization of walkways, parking lots, and other light-trafficked surfaces, a strong impermeable surface is desired, and a relatively heavy application of AEROSPRAY 70 binder, perhaps in a mixture of 1 part AEROSPRAY 70 binder to 1 part water, and applied at the rate of 0.5 or more gallons per square yard would be required. The optimum rate of application and dilution ratio should be determined by preliminary examination on a sample of the material to be treated, followed by a small field test.

FIGURE 2  
PORT ELIZABETH SAND: PARTICLE SIZE VS. PER CENT PASSING



# AEROSPRAY 70

binder

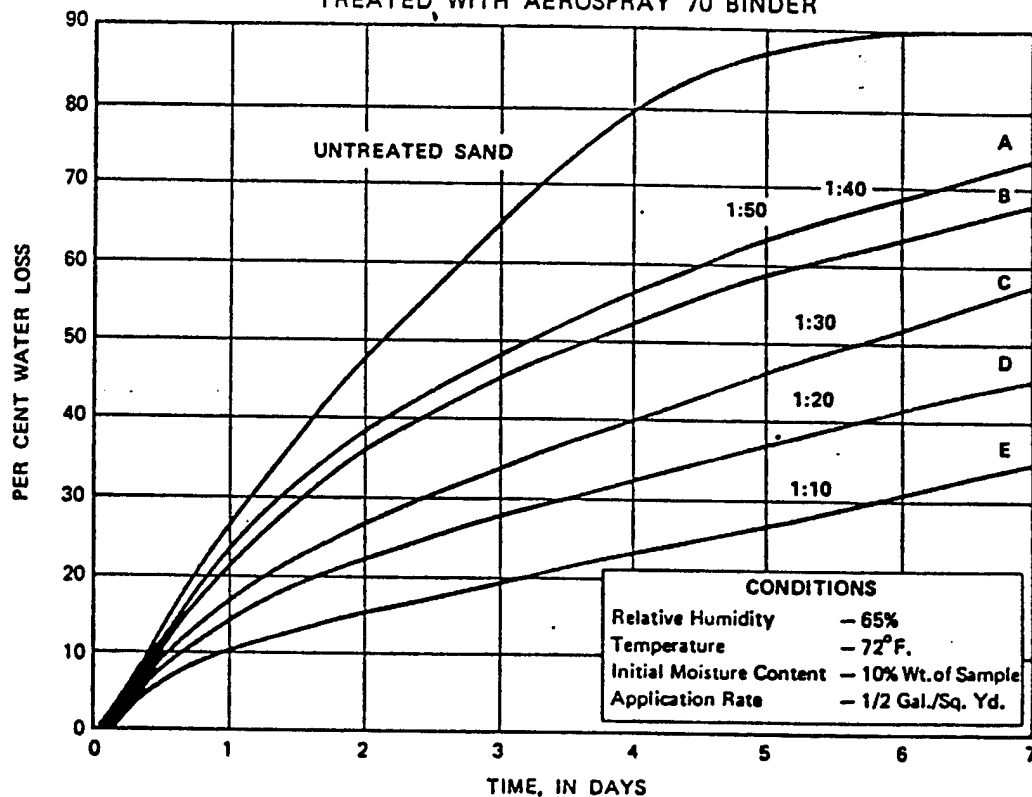
If AEROSPRAY 70 binder is applied lightly, in dilutions of 1 part to 20 or more parts of water, at  $\frac{1}{2}$  gallons per square yard; a high degree of binding can be expected, but the surface will remain permeable to water to the extent that seeds will germinate through the bound layer. This feature is invaluable in situations where the desired objective is long-term erosion control. The seeds will be held in place by the polymeric web until they have a chance to germinate. Upon germination, the plant cover will break up the bound layer, and establish itself as the first line of defense against erosion.

Treatment with AEROSPRAY 70 will substantially reduce evaporation losses. This is

particularly important in areas where farming is conducted under conditions where water is scarce or where water must be brought in by irrigation.

Figure 3 illustrates moisture loss for samples of sand treated with various concentrations of AEROSPRAY 70 binder ranging from one part AEROSPRAY 70 binder in ten parts water to one part AEROSPRAY 70 binder in fifty parts of water. At the beginning of the experiment half of the samples contain 10 per cent by weight of water. Note that the untreated sand lost nearly three times as much water in one week as did sample E. Note that even a treatment with a very dilute solution of AEROSPRAY 70 binder (sample A) was of significant benefit.

FIGURE 3  
MOISTURE LOSS THROUGH PORT ELIZABETH SAND  
TREATED WITH AEROSPRAY 70 BINDER



SPR: 50 gal / gal  
 - 1 Gal part  
 5.55 gal  
 1 Gal / 57 = 9.55 gal  
 3 Gal / 57 = 33.5 gal  
 AEROSPRAY 70

### Continuous Films

Very concentrated mixtures, containing more than 2 parts of AEROSPRAY 70 binder per part of water, form a continuous film when applied to substrates that are highly compacted, contain a high percentage of fine particles, or both. An example of this type of substrate is compacted clay. Application of concentrated AEROSPRAY 70 binder mixtures on clay will produce a tough, continuous film, impermeable to water when applied at a rate of 1 to 3 gallons per square yard. This is suitable for surfaces subjected to intermittent light vehicular traffic, such as highway shoulders, airport ramps and taxiways, and temporary road surfaces.

## Application Techniques

AEROSPRAY 70 binder requires only dilution with water to prepare it for use. Although exceptionally stable to dilution with hard water, it is good practice to use the cleanest water available for dilution and equipment clean-up.

Dilution of two parts AEROSPRAY 70 binder with 1 part of water, by volume, results in a fluid consistency suitable for spray or spreader application. However, the excellent dilution stability of the material permits further reduction to meet specific application demands. Experience has shown that simple mixing ratios in the following range will cover most requirements:

Part of Volume		Approximate Solids, Per Cent by Weight
AEROSPRAY 70 binder	Water	
2	1	41.1
1	1	31.5
1	10	5.8
1	20	2.9
1	50	1.2

AEROSPRAY 70 can be used to line farm ponds and irrigation canals to reduce the loss of water by penetration into the surrounding

soil. If the film liner is damaged by livestock, etc., it can easily be repaired by simply pouring some fresh AEROSPRAY 70 binder over the tear. The new material will bond securely to the old to form a seal. For applications with less severe service requirements than those described above, the quantity of AEROSPRAY 70 binder can be sharply reduced. The optimum dilution ratio and application rate are dictated by the characteristics of the substrate and the desired results of the treatment.

As a general rule, the best practice is to add the water to the material rather than the reverse. Use a recirculating pump for mixing if the application tank is not equipped with a stirrer. Manual mixing of drum quantities will suffice to produce a homogeneous dispersion.

When 10 per cent water is added to AEROSPRAY 70 binder, the viscosity of the mixture is reduced considerably. When 20 per cent or more water is added to AEROSPRAY 70 binder, the viscosity approaches that of water. This coupled with the excellent mechanical stability of AEROSPRAY 70 allows a wide latitude in the selection of methods of application of AEROSPRAY 70. In general, any method that will cause the mixture to strike the surface in a low speed spray with uniform coverage is acceptable.

## Application Equipment

The specific design of application equipment will be determined by the topography of the job site. In general, much of the equipment that is available for application of liquid fertilizers and insecticides, and for spreading asphalt emulsions can be used to apply AEROSPRAY 70 with little or no modification. Such equipment can be purchased with oversize tires to permit its use on unstable surfaces, like sand dunes. Hand-held

# AEROSPRAY 70

binder

pressure sprayers, commonly used for applying insecticides can be used for small jobs or for patching. A gravity feed water sprinkler truck can be used for applying the material to roadways, shoulders, parking lots, and other similar surfaces. The environment of each specific job will guide the selection of the proper application equipment.

In any case, the application system should consist of a tank for mixing and storing AEROSPRAY 70 binder and water, and one or more spray nozzles. The energy necessary for spraying the material can be supplied by pumping, or by pressurizing the hold tank. Suitable pumps include the Series 151 "Viking" pump, the "Blackmer" type GL sliding vane pump, and the "Waukesha Dualobe" pump. Centrifugal pumps can be used for handling diluted AEROSPRAY 70 binder and water mixtures. The concentrate is much too viscous for efficient use of centrifugals. A "Moyno" pump, fitted with a stainless shaft and rotor, also provides excellent service.

In all cases, pump shafts and bearings should be provided with a water-proof lubricant sealed off from the circulating AEROSPRAY 70. Since it is a water based material, AEROSPRAY 70 is not self lubricating. If it is allowed to leak into the pump bearings, rubbing friction may cause it to coalesce on bearing surfaces and may cause the pump to bind.

Spray nozzles should be selected to give a

coarse droplet spray at the desired delivery rate. High shear forces in the nozzle, caused by improper nozzle configuration, or excessive spraying pressure are to be avoided, as they will cause the product to atomize and, in effect, spray dry on its way to the target substrate. A Model ¼ T9520 nozzle, supplied by Spraying Systems, Inc. has been used effectively to produce a flat fan spray pattern with low atomization at approximately 20 gallons per minute with 40 psi. nozzle pressure. Application rates can be increased by selecting a larger nozzle of a similar configuration or by teaming several nozzles on a spray bar. It is best to position the nozzle between 6 and 12 inches above the target to minimize material losses.

Equipment clean-up is simple and easy, but must be done before the coating dries out. Equipment should also be clean *BEFORE* use. Tanks and lines need only be washed with water containing a small quantity of detergent. In general, it is desirable to start with a minimum of added water under recirculation, and then gradually increase the dilution while draining the equipment. Flush with fresh water until it runs clear.

As with all aqueous systems, AEROSPRAY 70 will promote rusting of plain steel. Corrosion resistant materials are desirable for permanent installations. Galvanized iron, brass, or other zinc containing mixtures should not be used.

(768-6054) 2" C-100 → (522-8391) 12/12/22 24  
 • Shrimm Witham 143 64 y.  
 Joy Instrument 2 1/2" 703 66  
 768-6008 55 20 Ton  
 Bill Hotstick

ADJUSTED

DEC. 09 1988

**AEROSPRAY 70**  
binder

#### SHIPPING

AEROSPRAY 70 binder is available in bulk shipment, as well as in 50-55 gallon fiber or steel, non-returnable drums (500 lbs. net wt.)

#### TECHNICAL SERVICE

Technical Service and information for making the best use of this product are available through your Cyanamid Sales Representative or nearest Sales Office.

## Specification

AEROSPRAY® 70 binder, a polyvinyl acetate emulsion resin, containing  $60 \pm 1\%$  total solids by weight, shall be applied in accordance with manufacturer's recommendations.

6970 S. TUCSON BLVD.  
TUCSON, ARIZONA 85706  
(602) 294-2643

#### ENGINEERING CHEMICALS SALES OFFICES

BERDAN AVENUE  
WAYNE, NEW JERSEY 07470  
(201) 831-1234

#### References

1. U.S. Patent No. 2,889,293
2. U.S. Patent No. 2,889,294
3. U.S. Patent No. 3,069,293
4. Published specifications

#### SHOP DRAWING REVIEW

6025 TATUM ST. ST. LOUIS, MO 63114  
Cyanamid Construction  
Contract DACW69-88-C-0001

☒ APPROVED  
☐ APPROVED AS NOTED

By: *JB*

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**CYANAMID**

INDUSTRIAL CHEMICALS AND PLASTICS DIVISION



APPROVED  
DEC. - 9 1988

"A"

MSDS NO. 0288-01  
CAS NO.  
DATE: 10/08/82

## MATERIAL SAFETY DATA

### PRODUCT IDENTIFICATION

TRADEMARK:	AEROSPRAY® 70 Binder
SYNONYMS:	None
CHEMICAL FAMILY:	Polyvinylacetate Latex
MOLECULAR FORMULA:	Mixture
MOLECULAR WGT.:	Mixture

### WARNING

NO WARNING STATEMENT

### HAZARDOUS INGREDIENTS

COMPONENT	CAS. NO.	%	TWA/CEILING	REFERENCE
No Permissible Exposure Limits (PEL), have been established by OSHA				

### NFPA HAZARD RATING

Not Established

### HEALTH HAZARD INFORMATION

#### EFFECTS OF OVEREXPOSURE:

Acute oral (rat) and acute dermal (rabbit) LD50 values are > 50.0 ml/kg and > 10.0 ml/kg, respectively. No appreciable skin irritation was produced during primary irritation studies with rabbits.

#### FIRST AID:

In case of skin contact, wash affected areas of skin with soap and water.

4025# 2074 ITEM# 3

EMERGENCY PHONE: 201/835-3100

AMERICAN CYANAMID COMPANY, WAYNE, NEW JERSEY 07470

**FIRE AND  
EXPLOSION  
HAZARD  
INFORMATION**

FLASH POINT:	Not Available
FLAMMABLE LIMITS (% BY VOL):	Not Available
AUTOIGNITION TEMP:	Not Available
DECOMPOSITION TEMP:	Not Available
FIRE FIGHTING:	Use water, carbon dioxide or dry chemical to extinguish fires. Wear self-contained, positive pressure breathing apparatus and full firefighting protective clothing.

**REACTIVITY DATA**

STABILITY:	Stable
CONDITIONS TO AVOID:	None known
POLYMERIZATION:	Will Not Occur
CONDITIONS TO AVOID:	None known
INCOMPATIBLE MATERIALS:	Strong oxidizing agents; strong acids, alkalies.
HAZARDOUS DECOMPOSITION PRODUCTS:	Thermal decomposition or combustion may produce carbon monoxide and/or carbon dioxide.

**PHYSICAL  
PROPERTIES**

APPEARANCE AND ODOR:	White, milky viscous liquid; mild odor
BOILING POINT:	212 F (100 C)
MELTING POINT:	~32 F; ~0 C (freezing point)
VAPOR PRESSURE:	Similar to water
SPECIFIC GRAVITY:	~1.10
VAPOR DENSITY:	Similar to water
% VOLATILE (BY VOL):	40%
OCTANOL/H <sub>2</sub> O PARTITION COEF.:	Not Available
pH:	Not Available
SATURATION IN AIR (BY VOL):	Similar to water
EVAPORATION RATE:	Similar to water
SOLUBILITY IN WATER:	Dispersible

MSDS NO. 0288-01  
AEROSPRAY® 70 Binder

**EXPOSURE  
CONTROL METHODS**

Engineering controls are not usually necessary, if good hygiene practices are strictly followed. Respiratory protection is generally not required during normal operations.

MSDS NO. 0288-01  
AEROSPRAY® 70 Binder

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**SPILL OR LEAK  
PROCEDURES**

STEPS TO BE TAKEN IN  
CASE MATERIAL IS  
RELEASED OR SPILLED:

Cover spills with some inert absorbent material; sweep  
up and place in a waste disposal container. Flush area  
with water.

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**WASTE DISPOSAL**

Disposal must be made in accordance with applicable governmental regulations.

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**SPECIAL  
PRECAUTIONS**

HANDLING AND  
STORAGE/OTHER:

None

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*Marvin A. Friedman*

Marvin A. Friedman, Ph.D., Director of Toxicology and Product Safety

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inducement, or recommendation to practice any patented invention without a license. It is offered solely for your consideration, investigation and  
verification. Before using any product read its label.

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## Appendix

### Section XII

SECTION	TITLE	PAGE
(N)	Phase I	
	.1 River wall	12-N.1-1 TO 12-N.1-6
	.2 Middle Wall	12-N.2-1 TO 12-N.2-4
	.3 D/S Main Chamber Miter Gate Sill	12-N.3-1 TO 12-N.3-2
	.4 D/S Main Chamber Bulkhead Sill	12-N.4-1 TO 12-N.4-2
	.5 D/S Aux. Chamber Miter Gate Sill	12-P.5-1 TO 12-N.5-2
	.6 D/s Aux. Chamber Bulkhead Sill	12-N.6-1 TO 12-N.6-2
(O)	Phase II	
	.1 River Wall	12-O.1-1 TO 12-O.1-4
	.2 Middle Wall	12-O.2-1 TO 12-O.2-8
	.3 Land Wall	12-O.3-1 TO 12-O.3-5
(P)	Phase III	
	.1 U/S Main Chamber Miter Gate Sill	12-P.1-1 TO 12-P.2-2
	.2 U/S Main Chamber Emg. Gate Sill	12-P.2-1 TO 12-P.2-2
	.3 U/S Aux. Chamber Miter Gate Sill	12-P.3-1 TO 12-P.3-2
	.4 U/S Aux. Chamber Emg. Gate Sill	12-P.4-1 TO 12-P.4-2

## RIVER WALL

12-N.1-1

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE I

#### RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
38	R-37	09+67.5B	R-19-S	10.00	0.00	0.02	0.00
39	R-38	09+57.5B	R-20-P	10.00	0.00	0.01	0.00
40	R-38	09+47.5B	R-20-S	10.00	0.00	0.00	0.00
41	R-38	09+37.5B	R-21-P	10.00	0.00	0.01	0.00
42	R-38	09+28.5B	R-21-S	10.00	0.00	0.00	0.00
43	R-38	09+18.5B	R-22-P	10.00	0.00	0.08	0.00
44	R-38	09+08.5B	R-22-S	10.00	0.00	0.02	0.00
45	R-39	08+98.5B	R-23-P	8.00	0.00	0.24	0.80
46	R-39	08+88.5B	R-23-S	8.00	0.00	0.03	0.00
47	R-39	08+87.5B	R-24-P	8.00	0.00	2.40	61.80
48	R-39	08+68.5B	R-24-S	8.00	0.00	0.00	0.00
49	R-39	08+58.5B	R-25-P	8.00	0.00	0.12	0.00
50	R-40	08+48.5B	R-25-S	10.00	0.00	0.00	0.00
51	R-40	08+38.5B	R-26-P	10.00	0.00	2.60	32.70
52	R-40	08+28.5B	R-26-S	10.00	0.00	0.01	0.00
53	R-40	08+18.5B	R-27-P	10.00	0.00	2.20	0.10
54	R-40	08+08.5B	R-27-S	10.00	0.00	0.15	0.00
55	R-41	07+98.5B	R-28-P	10.00	0.00	2.40	7.10
56	R-41	07+89.5B	R-28-S	10.00	0.00	0.01	0.00
57	R-41	07+79.5B	R-29-P	10.00	0.00	0.09	0.00
58	R-41	07+70.5B	R-29-S	10.00	0.00	0.02	0.00
59	R-42	07+60.5B	R-30-P	13.00	0.00	0.08	0.00
60	R-42	07+51.0B	R-30-S	13.00	0.00	0.04	0.00
61	R-42	07+41.5B	R-31-P	13.00	0.00	0.00	0.00
62	R-42	07+32.5B	R-31-S	13.00	0.00	0.00	0.00
63	R-42	07+22.5B	R-32-P	13.00	0.00	0.00	0.00
64	R-43	07+12.5B	R-32-S	13.00	0.00	0.00	0.00
65	R-43	07+02.5B	R-33-P	13.00	0.00	0.00	0.00
66	R-43	06+92.5B	R-33-S	13.00	0.00	0.00	0.00
67	R-43	06+82.5B	R-34-P	13.00	0.00	0.02	0.00
68	R-44	06+72.5B	R-34-S	13.00	0.00	0.01	0.00
69	R-44	06+62.5B	R-35-P	13.00	0.00	0.09	0.00
70	R-44	06+53.5B	R-35-S	13.00	0.00	0.10	0.00
71	R-44	06+44.5B	R-36-P	13.00	0.00	0.00	0.00
72	R-45	06+34.5B	R-36-S	13.00	0.00	0.03	0.00
73	R-45	06+24.5B	R-37-P	13.00	0.00	0.00	0.00
74	R-45	06+15.0B	R-37-S	13.00	0.00	0.00	0.00

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE I

#### RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
75	R-45	06+06.5B	R-38-P	13.00	0.00	0.00	0.00
76	R-45	05+96.5B	R-38-S	13.00	0.00	0.01	0.00
77	R-46	05+86.5B	R-39-P	13.00	0.00	0.04	0.00
78	R-46	05+76.5B	R-39-S	13.00	0.00	0.00	0.00
79	R-46	05+66.5B	R-40-P	13.00	0.00	0.02	0.00
80	R-46	05+56.5B	R-40-S	13.00	0.00	0.01	0.00
81	R-47	05+46.5B	R-41-P	10.00	0.00	2.99	18.10
82	R-47	05+37.5B	R-41-S	10.00	0.00	0.01	0.00
83	R-47	05+28.5B	R-42-P	10.00	0.00	3.13	32.40
84	R-47	05+18.5B	R-42-S	10.00	0.00	0.15	0.00
TOTALS				855.00	0.00	N/A	208.00

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE II

#### RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	R-30	13+31.5B	R-01-P	10.00	0.00	0.00	0.00
2	R-30	13+21.5B	R-01-S	10.00	0.00	0.00	0.00
3	R-30	13+11.5B	R-02-P	10.00	5.00	0.00	0.00
4	R-31	13+01.5B	R-02-S	10.00	0.00	0.03	0.00
5	R-31	12+96.5B	R-03-P	10.00	0.00	0.00	0.00
6	R-31	12+81.5B	R-03-S	10.00	0.00	0.04	0.00
7	R-31	12+71.5B	R-04-P	10.00	0.00	0.02	0.00
8	R-31	12+61.5B	R-04-S	10.00	0.00	0.00	0.00
9	R-31	12+51.5B	R-05-P	10.00	0.00	0.00	0.00
10	R-32	12+41.5B	R-05-S	10.00	0.00	0.00	0.00
11	R-32	12+31.5B	R-06-P	10.00	0.00	0.00	0.00
12	R-32	12+21.5B	R-06-S	10.00	0.00	0.09	0.00
13	R-32	12+11.5B	R-07-P	10.00	10.00	0.04	0.00
14	R-33	12+01.5B	R-07-S	10.00	0.00	0.00	0.00
15	R-33	11+91.5B	R-08-P	10.00	0.00	0.01	0.00
16	R-33	11+82.5B	R-08-S	10.00	0.00	0.01	0.00
17	R-33	11+72.5B	R-09-P	10.00	0.00	0.45	2.00
18	R-33	11+63.5B	R-09-S	10.00	0.00	0.29	0.00
19	R-34	11+53.5B	R-10-P	10.00	0.00	0.31	0.30
20	R-34	11+44.5B	R-10-S	10.00	0.00	0.25	1.70
21	R-34	11+35.5B	R-11-P	10.00	0.00	0.07	0.00
22	R-34	11+25.5B	R-11-S	10.00	0.00	0.04	0.00
23	R-34	11+15.5B	R-12-P	10.00	0.00	0.01	0.00
24	R-34	11+05.5B	R-12-S	10.00	0.00	0.03	0.00
25	R-34	10+95.5B	R-13-P	10.00	0.00	0.01	0.00
26	R-35	10+85.5B	R-13-S	10.00	0.00	0.17	0.00
27	R-35	10+75.5B	R-14-P	10.00	0.00	0.07	0.00
28	R-35	10+65.5B	R-14-S	10.00	0.00	0.14	0.00
29	R-35	10+55.5B	R-15-P	10.00	0.00	0.01	0.00
30	R-36	10+46.5B	R-15-S	10.00	0.00	0.01	0.00
31	R-36	10+37.5B	R-16-P	10.00	0.00	0.01	0.00
32	R-36	10+27.5B	R-16-S	10.00	0.00	0.01	0.00
33	R-36	10+17.5B	R-17-P	10.00	0.00	0.22	1.80
34	R-37	10+07.5B	R-17-S	10.00	0.00	0.16	0.00
35	R-37	09+97.5B	R-18-P	10.00	0.00	0.01	0.00
36	R-37	09+87.5B	R-18-S	10.00	0.00	0.03	0.00
37	R-37	09+77.5B	R-19-P	10.00	0.00	0.09	0.00

## GALLIPOLIS LOCK AND DAM

## DRILLING &amp; GROUTING

## PHASE I ZONE II

## RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
38	R-37	09+67.5B	R-19-S	10.00	0.00	0.07	0.00
39	R-38	09+57.5B	R-20-P	10.00	0.00	0.01	0.00
40	R-38	09+47.5B	R-20-S	10.00	0.00	0.00	0.00
41	R-38	09+37.5B	R-21-P	10.00	0.00	0.01	0.00
42	R-38	09+28.5B	R-21-S	10.00	0.00	0.00	0.00
43	R-38	09+18.5B	R-22-P	10.00	0.00	0.00	0.00
44	R-38	09+08.5B	R-22-S	10.00	0.00	0.00	0.00
45	R-39	08+98.5B	R-23-P	10.00	0.00	0.06	0.00
46	R-39	08+88.5B	R-23-S	10.00	0.00	0.07	0.00
47	R-39	08+87.5B	R-24-P	10.00	0.00	0.02	0.00
48	R-39	08+68.5B	R-24-S	10.00	0.00	0.14	0.00
49	R-39	08+58.5B	R-25-P	10.00	0.00	0.01	0.00
50	R-40	08+48.5B	R-25-S	10.00	10.00	0.00	0.00
51	R-40	08+38.5B	R-26-P	10.00	0.00	0.44	14.30
52	R-40	08+28.5B	R-26-S	10.00	10.00	0.01	0.00
53	R-40	08+18.5B	R-27-P	10.00	0.00	0.12	0.00
54	R-40	08+08.5B	R-27-S	10.00	10.00	0.01	0.00
55	R-41	07+98.5B	R-28-P	10.00	0.00	0.19	0.00
56	R-41	07+89.5B	R-28-S	10.00	0.00	0.02	0.00
57	R-41	07+79.5B	R-29-P	10.00	0.00	0.01	0.00
58	R-41	07+70.5B	R-29-S	10.00	0.00	0.02	0.00
59	R-42	07+60.5B	R-30-P	10.00	0.00	0.09	0.00
60	R-42	07+51.0B	R-30-S	10.00	0.00	0.06	0.00
61	R-42	07+41.5B	R-31-P	10.00	0.00	0.11	0.00
62	R-42	07+32.5B	R-31-S	10.00	0.00	0.01	0.00
63	R-42	07+22.5B	R-32-P	10.00	0.00	0.03	0.00
64	R-43	07+12.5B	R-32-S	10.00	0.00	0.00	0.00
65	R-43	07+02.5B	R-33-P	10.00	0.00	0.04	0.00
66	R-43	06+92.5B	R-33-S	10.00	0.00	0.00	0.00
67	R-43	06+82.5B	R-34-P	10.00	0.00	0.02	0.00
68	R-44	06+72.5B	R-34-S	10.00	0.00	0.07	0.00
69	R-44	06+62.5B	R-35-P	10.00	0.00	0.31	1.00
70	R-44	06+53.5B	R-35-S	10.00	0.00	0.06	0.00
71	R-44	06+44.5B	R-36-P	10.00	0.00	0.00	0.00
72	R-45	06+34.5B	R-36-S	10.00	0.00	0.05	0.00
73	R-45	06+24.5B	R-37-P	10.00	0.00	0.00	0.00
74	R-45	06+15.0B	R-37-S	10.00	0.00	0.01	0.00

GALLIPOLIS LOCK AND DAM

DRILLING & GROUTING

PHASE I ZONE II

RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
75	R-45	06+06.5B	R-38-P	10.00	0.00	0.04	0.00
76	R-45	05+96.5B	R-38-S	10.00	0.00	0.15	0.00
77	R-46	05+86.5B	R-39-P	10.00	0.00	0.05	0.00
78	R-46	05+76.5B	R-39-S	10.00	0.00	0.16	0.00
79	R-46	05+66.5B	R-40-P	10.00	0.00	0.02	0.00
80	R-46	05+56.5B	R-40-S	10.00	0.00	0.03	0.00
81	R-47	05+46.5B	R-41-P	10.00	0.00	0.00	0.00
82	R-47	05+37.5B	R-41-S	10.00	0.00	0.00	0.00
83	R-47	05+28.5B	R-42-P	10.00	0.00	0.00	0.00
84	R-47	05+18.5B	R-42-S	10.00	0.00	0.01	0.00
TOTALS				840.00	45.00	N/A	21.1

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE I

#### MIDDLE WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	M-15	08+77.5B	M-24-P	14.00	0.00	0.01	0.00
2	M-16	08+67.5B	M-24-S	14.00	0.00	0.01	0.00
3	M-16	08+57.5B	M-25-P	14.00	0.00	1.39	7.30
4	M-16	08+47.5B	M-25-S	14.00	0.00	0.00	0.00
5	M-16	08+37.5B	M-26-P	14.00	0.00	1.21	2.60
6	M-17	08+27.5B	M-26-S	14.00	0.00	0.00	0.00
7	M-17	08+17.5B	M-27-P	14.00	0.00	0.12	0.00
8	M-17	08+07.5B	M-27-S	14.00	0.00	0.00	0.00
9	M-17	07+97.5B	M-28-P	14.00	0.00	0.00	0.00
10	M-18	07+94.5B	M-28-S	14.00	0.00	0.02	0.00
11	M-18	07+84.5B	M-29-P	14.00	0.00	0.00	0.00
12	M-18	07+74.5B	M-29-S	14.00	0.00	0.01	0.00
13	M-18	07+64.5B	M-30-P	14.00	0.00	0.00	0.00
14	M-19	07+55.0B	M-30-S	14.00	0.00	0.48	4.00
15	M-19	07+46.0B	M-31-P	14.00	0.00	0.15	0.00
16	M-19	07+37.0B	M-31-S	14.00	0.00	0.00	0.00
17	M-19	07+28.0B	M-32-P	14.00	0.00	0.04	0.00
18	M-19	07+18.5B	M-32-S	14.00	0.00	0.00	0.00
19	M-20	07+08.5B	M-33-P	14.00	0.00	0.11	0.00
20	M-20	06+98.5B	M-33-S	14.00	0.00	0.01	0.00
21	M-20	06+88.5B	M-34-P	14.00	0.00	0.01	0.00
22	M-20	06+73.5B	M-34-S	14.00	0.00	0.01	0.00
23	M-21	06+63.5B	M-35-P	14.00	0.00	0.06	0.00
24	M-21	06+53.5B	M-35-S	14.00	0.00	0.03	0.00
25	M-21	06+43.5B	M-36-P	14.00	0.00	0.03	0.00
26	M-21	06+34.5B	M-36-S	14.00	0.00	0.00	0.00
27	M-21	06+25.5B	M-37-P	14.00	0.00	0.05	0.00
28	M-22	06+16.5B	M-37-S	14.00	0.00	0.01	0.00
29	M-22	06+07.5B	M-38-P	14.00	0.00	0.02	0.00
30	M-22	06+01.5B	M-38-S	14.00	0.00	0.08	0.00
31	M-22	05+95.5B	M-39-P	14.00	0.00	4.00	0.30
32	M-23	05+89.5B	M-39-S	14.00	0.00	0.14	0.00
33	M-23	05+83.5B	M-40-P	14.00	0.00	3.91	92.70
34	M-23	05+74.5B	M-40-S	14.00	0.00	0.00	0.00
35	M-23	05+65.5B	M-41-P	14.00	0.00	3.00	5.50

GALLIPOLIS LOCK AND DAM

DRILLING & GROUTING

PHASE I ZONE I

MIDDLE WALL

=====							
: NO.	: MONO NO.	: STATION NO.	: HOLE NO.	: DRILL FOOTAGE	: REDRILL FOOTAGE	: PRESS TEST	: GROUT CWT
=====							
: 36	: M-24	: 05+56.0B	: M-41-S	: 14.00	: 0.00	: 0.02	: 0.00
: 37	: M-24	: 05+46.5B	: M-42-P	: 14.00	: 0.00	: 0.03	: 0.00
: 38	: M-24	: 05+37.0B	: M-42-S	: 14.00	: 0.00	: 0.80	: 1.00
: 39	: M-24	: 05+27.5B	: M-43-P	: 14.00	: 0.00	: 0.53	: 2.90
: 40	: M-24	: 05+18.0B	: M-43-S	: 14.00	: 0.00	: 0.02	: 0.00
: 41	: M-25	: 05+08.5B	: M-44-P	: 14.00	: 0.00	: 0.11	: 0.00
=====							
TOTALS				: 574.00	: 0.00	: N/A	: 116.3
=====							

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE II

#### MIDDLE WALL

=====							
NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
=====							
1	M-15	08+77.5B	M-24-P	10.00	0.00	0.13	0.00
2	M-16	08+67.5B	M-24-S	10.00	0.00	0.00	0.00
3	M-16	08+57.5B	M-25-P	10.00	14.00	0.00	0.00
4	M-16	08+47.5B	M-25-S	10.00	0.00	0.04	0.00
5	M-16	08+37.5B	M-26-P	10.00	14.00	0.01	0.00
6	M-17	08+27.5B	M-26-S	10.00	0.00	0.02	0.00
7	M-17	08+17.5B	M-27-P	10.00	14.00	0.06	0.00
8	M-17	08+07.5B	M-27-S	10.00	0.00	0.02	0.00
9	M-17	07+97.5B	M-28-P	10.00	0.00	0.00	0.00
10	M-18	07+94.5B	M-28-S	10.00	0.00	0.06	0.00
11	M-18	07+84.5B	M-29-P	10.00	0.00	0.06	0.00
12	M-18	07+74.5B	M-29-S	10.00	0.00	0.04	0.00
13	M-18	07+64.5B	M-30-P	10.00	0.00	0.02	0.00
14	M-19	07+55.0B	M-30-S	10.00	0.00	0.02	0.00
15	M-19	07+46.0B	M-31-P	10.00	5.00	0.00	0.00
16	M-19	07+37.0B	M-31-S	10.00	5.00	0.05	0.00
17	M-19	07+28.0B	M-32-P	10.00	0.00	0.10	0.00
18	M-19	07+18.5B	M-32-S	10.00	0.00	0.13	0.00
19	M-20	07+08.5B	M-33-P	10.00	0.00	0.12	0.00
20	M-20	06+98.5B	M-33-S	10.00	0.00	0.05	0.00
21	M-20	06+88.5B	M-34-P	10.00	0.00	0.02	0.00
22	M-20	06+73.5B	M-34-S	10.00	0.00	0.06	0.00
23	M-21	06+63.5B	M-35-P	10.00	0.00	0.03	0.00
24	M-21	06+53.5B	M-35-S	10.00	0.00	0.06	0.00
25	M-21	06+43.5B	M-36-P	10.00	0.00	0.00	0.00
26	M-21	06+34.5B	M-36-S	10.00	0.00	0.16	0.00
27	M-21	06+25.5B	M-37-P	10.00	0.00	0.06	0.00
28	M-22	06+16.5B	M-37-S	10.00	0.00	0.10	0.00
29	M-22	06+07.5B	M-38-P	10.00	0.00	0.03	0.00
30	M-22	06+01.5B	M-38-S	10.00	0.00	0.17	0.00
31	M-22	05+95.5B	M-39-P	10.00	13.00	0.12	0.00
32	M-23	05+89.5B	M-39-S	10.00	0.00	0.17	0.00
33	M-23	05+83.5B	M-40-P	10.00	13.00	0.03	0.00
34	M-23	05+74.5B	M-40-S	10.00	0.00	0.42	0.90
35	M-23	05+65.5B	M-41-P	10.00	10.00	0.24	1.50

MIDDLE WALL

12-N.2-4

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE I

#### D/S M/L MITER GATE SILL

=====									
:	:	MONO	:	STATION	:	:	:	:	:
:	:	OFFSET	:	10+37.5B	:	HOLE	:	:	:
:	NO.	FROM	:	OFFSET	:	NO.	:	DRILL	REDRILL
:	:	:	:	:	:	:	:	FOOTAGE	FOOTAGE
:	:	:	:	:	:	:	:	TEST	GROUT
:	:	:	:	:	:	:	:	CWT	:
=====									
:	1	W/OC/S	:	78'-0.0"	:	LMGS-01-P:	:	10.00	0.00
:	2	W/OC/S	:	68'-8.0"	:	LMGS-01-S:	:	10.00	0.00
:	3	W/OC/S	:	58'-0.0"	:	LMGS-02-P:	:	10.00	0.00
:	4	W/OC/S	:	48'-8.0"	:	LMGS-02-S:	:	14.00	0.00
:	5	W/OC/S	:	38'-0.0"	:	LMGS-03-P:	:	14.00	0.00
:	6	W/OC/S	:	29'-3.0"	:	LMGS-03-S:	:	14.00	0.00
:	7	W/OC/S	:	20'-0.0"	:	LMGS-04-P:	:	14.00	0.00
:	8	W/OC/S	:	10'-0.0"	:	LMGS-04-S:	:	14.00	0.00
:	9	CENTER	:	0.0'-0.0	:	LMGS-05-P:	:	14.00	0.00
:	10	E/OC/S	:	10'-0.0"	:	LMGS-05-S:	:	14.00	0.00
:	11	E/OC/S	:	20-0.0"	:	LMGS-06-P:	:	14.00	0.00
:	12	E/OC/S	:	30'-0.0"	:	LMGS-06-S:	:	14.00	0.00
:	13	E/OC/S	:	40'-0.0"	:	LMGS-07-P:	:	14.00	0.00
:	14	E/OC/S	:	50'-0.0"	:	LMGS-07-S:	:	14.00	0.00
:	15	E/OC/S	:	60'-0.0"	:	LMGS-08-P:	:	4.00	0.00
:	16	E/OC/S	:	68'-0.0"	:	LMGS-08-S:	:	N/A	0.00
:	17	E/OC/S	:	76'-1.0"	:	LMGS-09-P:	:	N/A	0.00
:	:	:	:	:	:	:	:	0.00	0.00
=====									
:	TOTALS						:	188.00	0.00
:							:		N/A
:							:		6.53
=====									

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE II

#### D/S M/L MITER GATE SILL

NO.	MONO FROM	STATION 10+37.5B OFFSET	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	W/OC/S	78'-0.0"	LMGS-01-P	10.00	0.00	0.00	0.00
2	W/OC/S	68'-8.0"	LMGS-01-S	10.00	0.00	0.00	0.00
3	W/OC/S	58'-0.0"	LMGS-02-P	10.00	0.00	0.00	0.00
4	W/OC/S	48'-8.0"	LMGS-02-S	10.00	0.00	0.00	0.00
5	W/OC/S	38'-0.0"	LMGS-03-P	10.00	0.00	0.18	0.00
6	W/OC/S	29'-3.0"	LMGS-03-S	10.00	0.00	0.15	0.00
7	W/OC/S	20'-0.0"	LMGS-04-P	10.00	0.00	0.06	0.00
8	W/OC/S	10'-0.0"	LMGS-04-S	10.00	7.00	0.01	0.00
9	CENTER	0.0'-0.0	LMGS-05-P	10.00	0.00	0.02	0.00
10	E/OC/S	10'-0.0"	LMGS-05-S	10.00	0.00	0.01	0.00
11	E/OC/S	20'-0.0"	LMGS-06-P	10.00	0.00	0.02	0.00
12	E/OC/S	30'-0.0"	LMGS-06-S	10.00	0.00	0.01	0.00
13	E/OC/S	40'-0.0"	LMGS-07-P	10.00	0.00	0.00	0.00
14	E/OC/S	50'-0.0"	LMGS-07-S	10.00	0.00	1.06	10.50
15	E/OC/S	60'-0.0"	LMGS-08-P	10.00	0.00	0.00	0.00
16	E/OC/S	68'-0.0"	LMGS-08-S	14.00	0.00	0.00	0.00
17	E/OC/S	76'-1.0"	LMGS-09-P	14.00	0.00	0.04	0.00
TOTALS				178.00	7.00	N/A	10.5

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE I

#### D/S M/L BULKHEAD SILL

NO.	MONO FROM	STATION 13+35.0B OFFSET	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	W/OC/S	78'-8.0"	LMBS-01-P	10.00	0.00	0.01	0.00
2	W/OC/S	68'-8.0"	LMBS-01-S	10.00	0.00	0.03	0.00
3	W/OC/S	58'-8.0"	LMBS-02-P	10.00	0.00	0.00	0.00
4	W/OC/S	48'-8.0"	LMBS-02-S	10.00	0.00	0.00	0.00
5	W/OC/S	38'-8.0"	LMBS-03-P	10.00	0.00	0.00	0.00
6	W/OC/S	29'-4.0"	LMBS-03-S	10.00	0.00	0.00	0.00
7	W/OC/S	20'-0.0"	LMBS-04-P	10.00	0.00	0.00	0.00
8	W/OC/S	10'-0.0"	LMBS-04-S	10.00	0.00	0.00	0.00
9	CENTER	center	LMBS-05-P	10.00	0.00	0.00	0.00
10	E/OC/S	10'-0.0"	LMBS-05-S	10.00	0.00	0.00	0.00
11	E/OC/S	20'-0.0"	LMBS-06-P	10.00	0.00	0.00	0.00
12	E/OC/S	29'-3.0"	LMBS-06-S	14.00	0.00	0.05	0.00
13	E/OC/S	38'-6.0"	LMBS-07-P	10.00	0.00	0.13	0.00
14	E/OC/S	47'-9.0"	LMBS-07-S	10.00	0.00	0.00	0.00
15	E/OC/S	57'-0.0"	LMBS-08-P	10.00	0.00	0.00	0.00
16	E/OC/S	67'-0.0"	LMBS-08-S	0.00	0.00	N/A	0.00
17	E/OC/S	75'-5.0"	LMBS-09-P	0.00	0.00	N/A	0.00
				0.00	0.00	0.04	0.00
TOTALS				144.00	0.000	N/A	0.00

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE II

#### D/S M/L BULKHEAD SILL

NO.	MONO FROM	STATION OFFSET	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	W/OC/S	78'-8.0"	LMBS-01-P	10.00	0.00	0.00	0.00
2	W/OC/S	68'-8.0"	LMBS-01-S	10.00	0.00	0.00	0.00
3	W/OC/S	58'-8.0"	LMBS-02-P	10.00	0.00	0.08	0.00
4	W/OC/S	48'-8.0"	LMBS-02-S	10.00	0.00	0.01	0.00
5	W/OC/S	38'-8.0"	LMBS-03-P	10.00	0.00	0.02	0.00
6	W/OC/S	29'-4.0"	LMBS-03-S	10.00	0.00	0.00	0.00
7	W/OC/S	20'-0.0"	LMBS-04-P	10.00	0.00	0.02	0.00
8	W/OC/S	10'-0.0"	LMBS-04-S	10.00	0.00	0.00	0.00
9	OC	0.0-0.0	LMBS-05-P	10.00	0.00	0.01	0.00
10	E/OC/S	10'-0.0"	LMBS-05-S	10.00	0.00	0.00	0.00
11	E/OC/S	20'-0.0"	LMBS-06-P	10.00	0.00	0.10	0.00
12	E/OC/S	29'-3.0"	LMBS-06-S	10.00	0.00	0.17	0.00
13	E/OC/S	38'-6.0"	LMBS-07-P	10.00	0.00	0.04	0.00
14	E/OC/S	47'-9.0"	LMBS-07-S	10.00	0.00	0.01	0.00
15	E/OC/S	57'-0.0"	LMBS-08-P	9.00	0.00	0.00	0.00
16	E/OC/S	67'-0.0"	LMBS-08-S	9.00	0.00	0.00	0.00
17	E/OC/S	75'-5.0"	LMBS-09-P	9.00	0.00	0.00	0.00
TOTALS				158.00	0.000	N/A	0.00

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE I

#### D/S AUX MITER GATE SILL

NO.	MONO FROM	STATION 09+47.5B OFFSET	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	W/OC/S	71'-9.55"	LAGS-01-P	10.00	0.00	0.02	0.00
2	W/OC/S	65'-10.75	LAGS-01-S	10.00	0.00	0.02	0.00
3	W/OC/S	55'-3.5"	LAGS-01-T2	10.00	0.00	0.06	0.00
4	W/OC/S	50'-2.75	LAGS-02-P	14.00	0.00	0.06	0.00
5	W/OC/S	46'-9.5"	LAGS-02-T1	14.00	0.00	0.07	0.00
6	W/OC/S	45'-10.75	LAGS-02-S	14.00	0.00	0.42	21.50
7	W/OC/S	36'-9.5"	LAGS-02-T2	14.00	0.00	0.28	1.50
8	W/OC/S	31'-9.5"	LAGS-03-P	14.00	0.00	0.01	0.00
9	W/OC/S	26'-9.5"	LAGS-03-T1	14.00	0.00	0.05	0.00
10	W/OC/S	25'-10.75	LAGS-03-S	14.00	0.00	0.40	8.40
11	W/OC/S	16'-9.5"	LAGS-03-T2	14.00	0.00	0.02	0.00
12	W/OC/S	11'-9.5"	LAGS-04-P	14.00	0.00	0.00	0.00
13	W/OC/S	5'-10.75"	LAGS-04-S	14.00	0.00	0.02	0.40
14	W/OC/S	2'-11.75"	LAGS-05-P	14.00	0.00	0.00	0.00
15	E/OC/S	15'-0.0"	LAGS-05-S	14.00	0.00	0.00	0.00
16	E/OC/S	22'-11.38	LAGS-06-P	14.00	0.00	0.02	0.00
17	E/OC/S	35'-0.0"	LAGS-06-S	14.00	0.00	0.00	0.00
18	E/OC/S	42'-11.38	LAGS-07-P	14.00	0.00	2.07	9.80
19	E/OC/S	50'-0.0"	LAGS-07-S	8.50	0.00	2.33	0.00
20	E/OC/S	60'-0.0"	LAGS-08-P	9.00	0.00	0.02	0.00
21	E/OC/S	70'-0.0"	LAGS-08-S	8.50	0.00	0.01	0.00
22	E/OC/S	77'-0.0"	LAGS-09-P	9.00	0.00	0.04	0.00
TOTALS				212.00	0.000	N/A	41.60

## GALLIPOLIS LOCK AND DAM

## DRILLING &amp; GROUTING

## PHASE I ZONE II

## D/S AUX MITER GATE SILL

=====								
:	:	MONO	:	STATION	:	:	:	:
:	:	OFFSET	:	09+47.5B	:	HOLE	:	:
:	NO.:	FROM	:	OFFSET	:	NO.	:	:
=====								
:	:	:	:	:	:	DRILL	:	REDRILL:
:	:	:	:	:	:	FOOTAGE:	:	FOOTAGE:
:	:	:	:	:	:	:	:	PRESS:
:	:	:	:	:	:	:	:	GROUT
:	:	:	:	:	:	:	:	TEST
:	:	:	:	:	:	:	:	CWT
=====								
:	1	:	W/OC/S	:	71'-9.55"	:	LAGS-01-P	:
:	2	:	W/OC/S	:	65'-10.75	:	LAGS-01-S	:
:	3	:	W/OC/S	:	55'-3.5"	:	LAGS-01-T2:	:
:	4	:	W/OC/S	:	50'-2.75	:	LAGS-02-P	:
:	5	:	W/OC/S	:	46'-9.5"	:	LAGS-02-T1:	:
:	6	:	W/OC/S	:	45'-10.75	:	LAGS-02-S	:
:	7	:	W/OC/S	:	36'-9.5"	:	LAGS-02-T2:	:
:	8	:	W/OC/S	:	31'-9.5"	:	LAGS-03-P	:
:	9	:	W/OC/S	:	26'-9.5"	:	LAGS-03-T1:	:
:	10	:	W/OC/S	:	25'-10.75	:	LAGS-03-S	:
:	11	:	W/OC/S	:	16'-9.5"	:	LAGS-03-T2:	:
:	12	:	W/OC/S	:	11'-9.5"	:	LAGS-04-P	:
:	13	:	W/OC/S	:	5'-10.75"	:	LAGS-04-S	:
:	14	:	W/OC/S	:	2'-11.75"	:	LAGS-05-P	:
:	15	:	E/OC/S	:	15'-0.0"	:	LAGS-05-S	:
:	16	:	E/OC/S	:	22'-11.38	:	LAGS-06-P	:
:	17	:	E/OC/S	:	35'-0.0"	:	LAGS-06-S	:
:	18	:	E/OC/S	:	42'-11.38	:	LAGS-07-P	:
:	19	:	E/OC/S	:	50'-0.0"	:	LAGS-07-S	:
:	20	:	E/OC/S	:	60'-0.0"	:	LAGS-08-P	:
:	21	:	E/OC/S	:	70'-0.0"	:	LAGS-08-S	:
:	22	:	E/OC/S	:	77'-0.0"	:	LAGS-09-P	:
:	:	:	:	:	:	:	:	:
=====								
:	TOTALS					:	:	:
:						:	164.00	:
:						:	124.00	:
:						:	N/A	:
=====								

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE I ZONE I

#### D/S AUX. BULKHEAD SILL

NO.	MONO	STATION	HOLE	DRILL	REDRILL	PRESS	GROUT
FROM	OFFSET	NO.	FOOTAGE	FOOTAGE	TEST	CWT	
1	W/M-12	72'-5"	LABS-01-P:	6.00	0.00	0.00	0.00
2	W/M-12	63'-3"	LABS-01-S:	6.00	0.00	0.02	0.00
3	W/M-12	54'-1"	LABS-02-P:	6.00	0.00	0.00	0.00
4	W/OC/S	46'-2.75	LABS-02-S:	10.00	0.00	0.01	0.00
5	W/OC/S	38'-4.5"	LABS-03-P:	10.00	0.00	0.00	0.00
6	W/OC/S	29'-2.25	LABS-03-S:	10.00	0.00	0.00	0.00
7	W/OC/S	20'-0"	LABS-04-P:	10.00	0.00	0.00	0.00
8	W/OC/S	10'-0"	LABS-04-S:	10.00	0.00	0.00	0.00
9	CENTER	0'-0"	LABS-05-P:	10.00	0.00	0.02	0.00
10	E/OC/S	10'-0"	LABS-05-S:	10.00	0.00	0.04	0.00
11	E/OC/S	20'-0"	LABS-06-P:	10.00	0.00	0.02	0.00
12	E/OC/S	30'-0"	LABS-06-S:	10.00	0.00	0.00	0.00
13	E/OC/S	40'-0"	LABS-07-P:	10.00	0.00	0.08	0.00
14	E/L-6	48'-6"	LABS-07-S:	N/A	0.00	N/A	0.00
15	E/L-6	57'-0"	LABS-08-P:	N/A	0.00	N/A	0.00
16	E/L-6	66'-6"	LABS-08-S:	N/A	0.00	N/A	0.00
TOTALS				118.00	0.000	N/A	0.000

D/S AUX BULKHEAD SILL

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	R-48	05+08.5B	R-43-P	9.50	0.00	0.130	2.62
2	R-48	04+98.5B	R-43-S	10.00	0.00	0.016	0.00
3	R-48	04+88.5B	R-44-P	9.50	0.00	0.078	0.19
4	R-48	04+79.5B	R-44-S	9.50	0.00	0.237	0.57
5	R-48	04+70.5B	R-45-P	9.50	0.00	0.430	1.17
6	R-49	04+60.5B	R-45-S	10.00	0.00	0.180	1.63
7	R-49	04+50.5B	R-46-P	9.50	0.00	0.290	0.67
8	R-49	04+40.5B	R-46-S	10.00	0.00	0.450	1.28
9	R-49	04+30.5B	R-47-P	9.50	0.00	0.012	0.05
10	R-50	04+20.5B	R-47-S	10.00	0.00	0.002	0.00
11	R-50	04+10.5B	R-48-P	10.00	0.00	0.006	0.09
12	R-50	04+00.5B	R-48-S	10.00	0.00	0.122	0.00
13	R-50	03+92.5B	R-49-P	10.50	0.00	0.158	0.58
14	R-51	03+82.5B	R-49-S	10.00	0.00	0.470	2.02
15	R-51	03+72.5B	R-50-P	10.00	0.00	0.166	8.14
16	R-51	03+63.5B	R-50-S	10.00	0.00	0.020	0.07
17	R-51	03+54.5B	R-51-P	10.50	0.00	0.234	0.44
18	R-51	03+44.5B	R-51-S	10.00	0.00	0.028	0.00
19	R-52	03+34.5B	R-52-P	10.50	0.00	0.006	0.00
20	R-52	03+24.5B	R-52-S	10.00	0.00	0.000	0.00
21	R-52	03+14.5B	R-53-P	10.00	0.00	0.000	0.00
22	R-52	03+04.5B	R-53-S	10.00	0.00	0.006	0.00
23	R-53	02+94.5B	R-54-P	10.50	0.00	0.008	0.00
24	R-53	02+85.5B	R-54-S	10.00	0.00	0.080	0.00
25	R-53	02+76.5B	R-55-P	10.50	0.00	0.022	0.00
26	R-53	02+66.5B	R-55-S	10.00	0.00	0.004	0.00
27	R-54	02+56.5B	R-56-P	10.50	0.00	0.004	0.00
28	R-54	02+46.5B	R-56-S	10.00	0.00	0.002	0.00
29	R-54	02+36.5B	R-57-P	10.00	0.00	0.004	0.00
30	R-54	02+26.5B	R-57-S	10.00	0.00	0.006	0.00
31	R-55	02+16.5B	R-58-P	10.50	0.00	0.210	1.27
32	R-55	02+06.5B	R-58-S	10.00	0.00	0.126	0.42
33	R-55	01+96.5B	R-59-P	10.50	0.00	2.800	7.50
34	R-55	01+86.5B	R-59-S	10.50	0.00	0.118	0.46
35	R-56	01+76.5B	R-60-P	10.00	0.00	1.400	0.00

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
36	R-56	01+66.5B	R-60-S	10.00	0.00	0.140	0.28
37	R-56	01+56.5B	R-61-P	10.00	0.00	0.052	0.00
38	R-56	01+46.5B	R-61-S	10.00	0.00	0.030	0.00
39	R-56	01+36.5B	R-62-P	10.00	0.00	0.000	0.00
40	R-57	01+26.5B	R-62-S	10.00	0.00	0.020	0.00
41	R-57	01+16.5B	R-63-P	10.00	0.00	0.000	0.00
42	R-57	01+06.5B	R-63-S	10.00	0.00	0.050	0.00
43	R-57	00+96.5B	R-64-P	10.00	0.00	0.308	0.00
44	R-57	00+86.5B	R-64-S	10.00	0.00	0.032	0.00
45	R-58	00+76.5B	R-65-P	10.00	0.00	0.580	42.44
46	R-58	00+66.5B	R-65-S	10.00	0.00	0.002	0.00
47	R-58	00+56.5B	R-66-P	10.00	0.00	0.164	0.41
48	R-58	00+46.5B	R-66-S	10.00	0.00	0.000	0.00
49	R-58	00+36.5B	R-67-P	10.00	0.00	0.102	0.00
50	R-59	00+26.5B	R-67-S	10.00	0.00	0.078	0.00
51	R-59	00+16.5B	R-68-P	10.00	0.00	0.004	0.00
52	R-59	00+06.5B	R-68-S	10.00	0.00	0.002	0.00
53	R-59	00+03.5A	R-69-P	10.00	0.00	0.004	0.00
54	R-59	00+13.5A	R-69-S	10.00	0.00	0.002	0.00
55	R-60	00+23.5A	R-70-P	10.00	0.00	0.370	18.46
56	R-60	00+33.5A	R-70-S	10.00	0.00	0.002	0.00
57	R-60	00+41.5A	R-71-P	10.00	0.00	0.410	0.16
58	R-60	00+51.5A	R-71-S	10.00	0.00	0.012	0.00
59	R-60	00+61.5A	R-72-P	10.00	0.00	0.040	0.00
60	R-61	00+71.5A	R-72-S	10.00	0.00	0.004	0.00
61	R-61	00+81.5A	R-73-P	10.00	0.00	0.000	0.00
62	R-61	00+91.5A	R-73-S	10.00	0.00	0.044	0.00
63	R-61	01+01.5A	R-74-P	10.50	0.00	0.044	0.00
64	R-61	01+11.5A	R-74-S	10.00	0.00	0.000	0.00
65	R-62	01+16.5A	R-75-P	10.50	0.00	0.000	0.00
66	R-62	01+19.5A	R-75-S	10.50	0.00	0.000	0.00
TOTALS				663.00	0.00	N/A	90.91

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE II

#### RIVER WALL

=====																
:	:	MONO	:	STATION	:	HOLE	:	DRILL	:	REDRILL	:	PRESS	:	GROUT	:	
:	NO.	NO.	:	NO.	:	NO.	:	FOOTAGE	:	FOOTAGE	:	TEST	:	CWT	:	
=====																
:	1	:	R-48	:	05+08.5B	:	R-43-P	:	10.00	:	0.00	:	0.02	:	0.00	:
:	2	:	R-48	:	04+98.5B	:	R-43-S	:	10.00	:	0.00	:	0.03	:	0.00	:
:	3	:	R-48	:	04+88.5B	:	R-44-P	:	10.00	:	0.00	:	0.06	:	0.00	:
:	4	:	R-48	:	04+79.5B	:	R-44-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	5	:	R-48	:	04+70.5B	:	R-45-P	:	10.50	:	2.00	:	0.00	:	0.00	:
:	6	:	R-49	:	04+60.5B	:	R-45-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	7	:	R-49	:	04+50.5B	:	R-46-P	:	10.50	:	0.00	:	0.09	:	0.00	:
:	8	:	R-49	:	04+40.5B	:	R-46-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	9	:	R-49	:	04+30.5B	:	R-47-P	:	10.50	:	0.00	:	0.02	:	0.00	:
:	10	:	R-50	:	04+20.5B	:	R-47-S	:	10.00	:	0.00	:	0.01	:	0.00	:
:	11	:	R-50	:	04+10.5B	:	R-48-P	:	10.50	:	0.00	:	0.05	:	0.07	:
:	12	:	R-50	:	04+00.5B	:	R-48-S	:	10.00	:	0.00	:	0.69	:	1.55	:
:	13	:	R-50	:	03+92.5B	:	R-49-P	:	10.00	:	0.00	:	0.01	:	0.25	:
:	14	:	R-51	:	03+82.5B	:	R-49-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	15	:	R-51	:	03+72.5B	:	R-50-P	:	10.00	:	0.00	:	0.00	:	0.00	:
:	16	:	R-51	:	03+63.5B	:	R-50-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	17	:	R-51	:	03+54.5B	:	R-51-P	:	10.00	:	0.00	:	0.02	:	0.00	:
:	18	:	R-51	:	03+44.5B	:	R-51-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	19	:	R-52	:	03+34.5B	:	R-52-P	:	10.00	:	0.00	:	0.06	:	0.00	:
:	20	:	R-52	:	03+24.5B	:	R-52-S	:	10.00	:	0.00	:	0.03	:	0.00	:
:	21	:	R-52	:	03+14.5B	:	R-53-P	:	10.00	:	0.00	:	0.03	:	0.00	:
:	22	:	R-52	:	03+04.5B	:	R-53-S	:	10.00	:	0.00	:	0.02	:	0.00	:
:	23	:	R-53	:	02+94.5B	:	R-54-P	:	10.00	:	0.00	:	0.06	:	0.00	:
:	24	:	R-53	:	02+85.5B	:	R-54-S	:	10.00	:	0.00	:	0.16	:	0.00	:
:	25	:	R-53	:	02+76.5B	:	R-55-P	:	10.00	:	0.00	:	0.01	:	0.00	:
:	26	:	R-53	:	02+66.5B	:	R-55-S	:	10.00	:	2.00	:	0.00	:	0.00	:
:	27	:	R-54	:	02+56.5B	:	R-56-P	:	10.00	:	0.00	:	0.00	:	0.00	:
:	28	:	R-54	:	02+46.5B	:	R-56-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	29	:	R-54	:	02+36.5B	:	R-57-P	:	10.00	:	0.00	:	0.01	:	0.00	:
:	30	:	R-54	:	02+26.5B	:	R-57-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	31	:	R-55	:	02+16.5B	:	R-58-P	:	10.00	:	0.00	:	0.05	:	0.00	:
:	32	:	R-55	:	02+06.5B	:	R-58-S	:	10.00	:	9.00	:	0.00	:	0.00	:
:	33	:	R-55	:	01+96.5B	:	R-59-P	:	10.00	:	8.00	:	0.01	:	0.00	:
:	34	:	R-55	:	01+86.5B	:	R-59-S	:	10.00	:	0.00	:	0.00	:	0.00	:
:	35	:	R-56	:	01+76.5B	:	R-60-P	:	10.00	:	6.00	:	0.01	:	0.00	:
:	36	:	R-56	:	01+66.5B	:	R-60-S	:	10.00	:	5.00	:	0.06	:	0.00	:
:	37	:	R-56	:	01+56.5B	:	R-61-P	:	10.00	:	0.00	:	0.12	:	0.00	:

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE II

#### RIVER WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
38	R-56	01+46.5B	R-61-S	10.00	0.00	0.01	0.00
39	R-56	01+36.5B	R-62-P	10.00	0.00	0.05	0.00
40	R-57	01+26.5B	R-62-S	10.00	0.00	0.01	0.00
41	R-57	01+16.5B	R-63-P	10.00	0.00	0.14	0.00
42	R-57	01+06.5B	R-63-S	10.00	0.00	0.04	0.00
43	R-57	00+96.5B	R-64-P	10.00	0.00	0.06	0.00
44	R-57	00+86.5B	R-64-S	10.00	0.00	0.00	0.00
45	R-58	00+76.5B	R-65-P	10.00	2.00	0.00	0.00
46	R-58	00+66.5B	R-65-S	10.00	0.00	0.01	0.00
47	R-58	00+56.5B	R-66-P	10.00	0.00	0.06	0.00
48	R-58	00+46.5B	R-66-S	10.00	0.00	0.01	0.00
49	R-58	00+36.5B	R-67-P	10.00	0.00	0.01	0.00
50	R-59	00+26.5B	R-67-S	10.00	0.00	0.06	0.00
51	R-59	00+16.5B	R-68-P	10.00	0.00	0.00	0.00
52	R-59	00+06.5B	R-68-S	10.50	0.00	0.01	0.00
53	R-59	00+03.5A	R-69-P	10.00	0.00	0.00	0.00
54	R-59	00+13.5A	R-69-S	10.50	0.00	0.01	0.00
55	R-60	00+23.5A	R-70-P	10.00	0.00	0.02	0.00
56	R-60	00+33.5A	R-70-S	10.00	0.00	0.06	0.00
57	R-60	00+41.5A	R-71-P	10.00	0.00	0.02	0.00
58	R-60	00+51.5A	R-71-S	10.50	0.00	0.04	0.00
59	R-60	00+61.5A	R-72-P	10.00	0.00	0.02	0.00
60	R-61	00+71.5A	R-72-S	10.50	0.00	0.00	0.00
61	R-61	00+81.5A	R-73-P	10.00	0.00	0.00	0.00
62	R-61	00+91.5A	R-73-S	10.50	0.00	0.06	0.00
63	R-61	01+01.5A	R-74-P	10.00	0.00	0.01	0.00
64	R-61	01+11.5A	R-74-S	10.50	0.00	0.00	0.00
65	R-62	01+16.5A	R-75-P	10.00	0.00	0.00	0.00
66	R-62	01+19.5A	R-75-S	10.50	0.00	0.00	0
67							
TOTALS				543.00	34.00	N/A	1.87

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### MIDDLE WALL

=====							
: NO. :	:	STATION NO.	HOLE NO.	DRILL FOOTAGE :	REDRILL FOOTAGE :	PRESS TEST :	GROUT CWT :
=====							
: 1 :	M-6 :	13+31.5B :	M-01-P :	9.00 :	0.00 :	0.016 :	0.00 :
: 2 :	M-6 :	13+21.5B :	M-01-S :	13.00 :	0.00 :	0.000 :	0.00 :
: 3 :	M-6 :	13+13.5B :	M-02-P :	16.00 :	0.00 :	0.002 :	0.00 :
: 4 :	M-7 :	13+01.5B :	M-02-S :	12.00 :	0.00 :	0.000 :	0.00 :
: 5 :	M-7 :	12+91.5B :	M-03-P :	18.00 :	0.00 :	0.008 :	0.00 :
: 6 :	M-7 :	12+81.5B :	M-03-S :	14.00 :	0.00 :	0.000 :	0.00 :
: 7 :	M-7 :	12+71.5B :	M-04-P :	16.00 :	0.00 :	0.002 :	0.00 :
: 8 :	M-7 :	12+61.5B :	M-04-S :	14.50 :	0.00 :	0.000 :	0.00 :
: 9 :	M-7 :	12+51.5B :	M-05-P :	14.50 :	0.00 :	0.002 :	0.00 :
: 10 :	M-8 :	12+41.5B :	M-05-S :	14.50 :	0.00 :	0.018 :	0.00 :
: 11 :	M-8 :	12+31.5B :	M-06-P :	14.50 :	0.00 :	0.020 :	0.00 :
: 12 :	M-8 :	12+21.5B :	M-06-S :	14.50 :	0.00 :	0.074 :	0.00 :
: 13 :	M-8 :	12+11.5B :	M-07-P :	14.50 :	0.00 :	0.018 :	0.00 :
: 14 :	M-9 :	12+01.5B :	M-07-S :	16.50 :	0.00 :	0.004 :	0.000 :
: 15 :	M-9 :	11+91.5B :	M-08-P :	16.50 :	0.00 :	1.700 :	13.790 :
: 16 :	M-9 :	11+82.0B :	M-08-S :	17.00 :	0.00 :	0.000 :	0.000 :
: 17 :	M-9 :	11+72.5B :	M-09-P :	16.50 :	0.00 :	0.580 :	0.092 :
: 18 :	M-9 :	11+64.3B :	M-09-S :	17.00 :	0.00 :	0.000 :	0.000 :
: 19 :	M-9 :	11+53.5B :	M-10-P :	16.50 :	0.00 :	0.450 :	0.370 :
: 20 :	M-10 :	11+44.5B :	M-10-S :	16.50 :	0.00 :	0.004 :	0.000 :
: 21 :	M-10 :	11+35.5B :	M-11-P :	13.50 :	0.00 :	0.002 :	0.000 :
: 22 :	M-10 :	11+25.5B :	M-11-S :	16.50 :	0.00 :	0.000 :	0.000 :
: 23 :	M-10 :	11+15.5B :	M-12-P :	13.50 :	0.00 :	0.010 :	0.000 :
: 24 :	M-10 :	11+05.5B :	M-12-S :	16.50 :	0.00 :	0.004 :	0.000 :
: 25 :	M-11 :	10+95.5B :	M-13-P :	7.00 :	0.00 :	0.002 :	0.000 :
: 26 :	M-11 :	10+85.5B :	M-13-S :	7.50 :	0.00 :	0.018 :	0.000 :
: 27 :	M-11 :	10+75.5B :	M-14-P :	7.00 :	0.00 :	0.002 :	0.000 :
: 28 :	M-11 :	10+65.5B :	M-14-S :	7.50 :	0.00 :	0.000 :	0.000 :
: 29 :	M-11 :	10+55.0B :	M-15-P :	8.00 :	0.00 :	0.000 :	0.000 :
: 30 :	M-12 :	10+46.5B :	M-15-S :	7.50 :	0.00 :	0.000 :	0.000 :
: 31 :	M-12 :	10+37.5B :	M-16-P :	10.00 :	0.00 :	0.010 :	0.000 :
: 32 :	M-12 :	10+27.5B :	M-16-S :	7.50 :	0.00 :	0.000 :	0.000 :
: 33 :	M-12 :	10+17.5B :	M-17-P :	9.00 :	0.00 :	0.002 :	0.000 :
: 34 :	M-12 :	10+07.5B :	M-17-S :	8.00 :	0.00 :	0.000 :	0.000 :
: 35 :	M-13 :	09+97.5B :	M-18-P :	10.50 :	0.00 :	0.002 :	0.000 :

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### MIDDLE WALL

NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
36	M-13 : 09+87.5B	M-18-S	9.50	0.00	0.000	0.000
37	M-13 : 09+77.5B	M-19-P	10.50	0.00	0.000	0.000
38	M-13 : 09+66.5B	M-19-S	9.50	0.00	0.000	0.000
39	M-13 : 09+57.5B	M-20-P	10.50	0.00	0.000	0.000
40	M-14 : 09+49.0B	M-20-S	9.50	0.00	0.000	0.000
41	M-14 : 09+37.5B	M-21-P	10.50	0.00	0.000	0.000
42	M-14 : 09+27.5B	M-21-S	10.50	0.00	0.000	0.000
43	M-14 : 09+17.5B	M-22-P	10.50	0.00	0.000	0.000
44	M-14 : 09+07.5B	M-22-S	9.00	0.00	0.004	0.000
45	M-15 : 08+97.5B	M-23-P	13.50	0.00	0.000	0.000
46	M-15 : 08+87.5B	M-23-S	14.00	0.00	0.012	0.000
47	M-25 : 04+78.5B	M-44-S	10.50	0.00	0.034	0.000
48	M-25 : 04+68.5B	M-45-P	10.00	0.00	0.000	0.000
49	M-25 : 04+58.5B	M-45-S	10.50	0.00	0.000	0.000
50	M-26 : 04+48.5B	M-46-P	10.00	0.00	0.000	0.000
51	M-26 : 04+39.0B	M-46-S	10.50	0.00	2.040	17.350
52	M-26 : 04+29.5B	M-47-P	10.00	0.00	0.000	0.000
53	M-26 : 04+20.0B	M-47-S	10.50	0.00	1.120	4.290
54	M-27 : 04+10.5B	M-48-P	10.00	0.00	0.000	0.000
55	M-27 : 04+01.0B	M-48-S	10.00	0.00	0.000	0.000
56	M-27 : 03+91.5B	M-49-P	9.50	0.00	0.000	0.000
57	M-27 : 03+82.0B	M-49-S	10.00	0.00	0.000	0.000
58	M-27 : 03+72.5B	M-50-P	9.50	0.00	0.000	0.000
59	M-28 : 03+63.5B	M-50-S	10.00	0.00	1.430	4.320
60	M-28 : 03+54.5B	M-51-P	9.50	0.00	0.000	0.000
61	M-28 : 03+45.5B	M-51-S	10.00	0.00	0.349	0.580
62	M-28 : 03+36.5B	M-52-P	9.50	0.00	0.000	0.000
63	M-29 : 03+26.5B	M-52-S	10.00	0.00	0.108	0.000
64	M-29 : 03+16.5B	M-53-P	10.00	0.00	0.000	0.000
65	M-29 : 03+06.5B	M-53-S	10.00	0.00	0.000	0.000
66	M-29 : 02+96.5B	M-54-P	9.00	0.00	0.000	0.000
67	M-29 : 02+86.5B	M-54-S	10.00	0.00	0.570	0.047
68	M-30 : 02+76.5B	M-55-P	8.50	0.00	0.002	0.000
69	M-30 : 02+66.5B	M-55-S	10.00	0.00	0.060	0.000
70	M-30 : 02+56.5B	M-56-P	10.00	0.00	0.000	0.000
			10.00	0.00	0.226	0.230

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### MIDDLE WALL

NO.	STATION	HOLE	DRILL	REDRILL	PRESS	GROUT
NO.	NO.	NO.	FOOTAGE	FOOTAGE	TEST	CWT
71	M-30	02+46.5B	M-56-S	9.50	0.00	0.000
72	M-30	02+36.5B	M-57-P	10.00	0.00	0.000
73	M-31	02+26.5B	M-57-S	10.00	0.00	0.002
74	M-31	02+16.5B	M-58-P	10.00	0.00	0.000
75	M-31	02+06.5B	M-58-S	9.50	0.00	0.000
76	M-31	01+96.5B	M-59-P	10.00	0.00	0.000
77	M-31	01+86.5B	M-59-S	9.50	0.00	0.002
78	M-32	01+76.5B	M-60-P	10.00	0.00	0.000
79	M-32	01+66.5B	M-60-S	9.50	0.00	0.000
80	M-32	01+56.5B	M-61-P	10.00	0.00	0.000
81	M-32	01+46.5B	M-61-S	9.50	0.00	0.000
82	M-32	01+36.5B	M-62-P	10.00	0.00	0.000
83	M-33	01+26.5B	M-62-S	10.00	0.00	0.000
84	M-33	01+16.5B	M-63-P	10.00	0.00	0.000
85	M-33	01+06.5B	M-63-S	10.00	0.00	0.000
86	M-33	00+96.5B	M-64-P	10.00	0.00	0.000
87	M-33	00+86.5B	M-64-S	10.00	0.00	0.000
88	M-34	00+76.5B	M-65-P	10.00	0.00	0.002
89	M-34	00+66.5B	M-65-S	10.00	0.00	0.000
90	M-34	00+56.5B	M-66-P	10.00	0.00	0.000
91	M-34	00+46.5B	M-66-S	10.00	0.00	0.000
92	M-34	00+36.5B	M-67-P	10.00	0.00	0.002
93	M-35	00+26.5B	M-67-S	10.00	0.00	0.000
94	M-35	00+16.5B	M-68-P	10.00	0.00	0.002
95	M-35	00+06.5B	M-68-S	12.00	0.00	0.002
96	M-35	00+03.5A	M-69-P	12.50	0.00	0.000
97	M-35	00+13.5A	M-69-S	12.00	0.00	0.000
98	M-36	00+23.5A	M-70-P	13.00	0.00	0.000
99	M-36	00+33.5A	M-70-S	12.00	0.00	0.000
100	M-36	00+41.5A	M-71-P	13.50	0.00	0.000
101	M-36	00+51.5A	M-71-S	12.00	0.00	0.000
102	M-36	00+61.5A	M-72-P	13.00	0.00	0.000
103	M-37	00+71.5A	M-72-S	12.00	0.00	0.000
104	M-37	00+81.5A	M-73-P	13.50	0.00	0.000
105	M-37	00+91.5A	M-73-S	12.00	0.00	0.000

GALLIPOLIS LOCK AND DAM

DRILLING & GROUTING

PHASE II ZONE I

MIDDLE WALL

NO.		STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
106	M-37	01+01.5A	M-74-P	13.50	0.00	0.000	0.000
107	M-37	01+11.5A	M-74-S	14.00	0.00	0.000	0.000
108	M-38	01+21.5A	M-75-P	14.00	0.00	0.000	0.000
109	M-38	01+25.0A	M-75-S	14.00	0.00	0.002	0.000
110	M-38	01+30.0A	M-76-P	15.00	0.00	0.000	0.000
111	M-38	01+35.0A	M-76-S	14.00	0.00	0.000	0.000
TOTALS				1,265.50	0.00	N/A	41.069

GALLIPOLIS LOCK AND DAM

DRILLING & GROUTING

PHASE II ZONE II

MIDDLE WALL

=====							
:	:	:	:	:	:	:	:
: NO.	:	: STATION	: HOLE	: DRILL	: REDRILL:	PRESS	GROUT
:	:	: NO.	: NO.	: FOOTAGE	: FOOTAGE:	TEST	CWT
=====							
:	1	: M-6	: 13+31.5B:	M-01-P :	0.00 :	0.00 :	0.000 :
:	2	: M-6	: 13+21.5B:	M-01-S :	0.00 :	0.00 :	0.000 :
:	3	: M-6	: 13+13.5B:	M-02-P :	0.00 :	0.00 :	0.000 :
:	4	: M-7	: 13+01.5B:	M-02-S :	0.00 :	0.00 :	0.000 :
:	5	: M-7	: 12+91.5B:	M-03-P :	0.00 :	0.00 :	0.000 :
:	6	: M-7	: 12+81.5B:	M-03-S :	0.00 :	0.00 :	0.000 :
:	7	: M-7	: 12+71.5B:	M-04-P :	0.00 :	0.00 :	0.000 :
:	8	: M-7	: 12+61.5B:	M-04-S :	0.00 :	0.00 :	0.000 :
:	9	: M-7	: 12+51.5B:	M-05-P :	0.00 :	0.00 :	0.000 :
:	10	: M-8	: 12+41.5B:	M-05-S :	0.00 :	0.00 :	0.000 :
:	11	: M-8	: 12+31.5B:	M-06-P :	0.00 :	0.00 :	0.000 :
:	12	: M-8	: 12+21.5B:	M-06-S :	0.00 :	0.00 :	0.000 :
:	13	: M-8	: 12+11.5B:	M-07-P :	0.00 :	0.00 :	0.000 :
:	14	: M-9	: 12+01.5B:	M-07-S :	0.00 :	0.00 :	0.000 :
:	15	: M-9	: 11+91.5B:	M-08-P :	0.00 :	0.00 :	0.000 :
:	16	: M-9	: 11+82.0B:	M-08-S :	0.00 :	0.00 :	0.000 :
:	17	: M-9	: 11+72.5B:	M-09-P :	0.00 :	0.00 :	0.000 :
:	18	: M-9	: 11+64.3B:	M-09-S :	0.00 :	0.00 :	0.000 :
:	19	: M-9	: 11+53.5B:	M-10-P :	0.00 :	0.00 :	0.000 :
:	20	: M-10	: 11+44.5B:	M-10-S :	0.00 :	0.00 :	0.000 :
:	21	: M-10	: 11+35.5B:	M-11-P :	0.00 :	0.00 :	0.000 :
:	22	: M-10	: 11+25.5B:	M-11-S :	0.00 :	0.00 :	0.000 :
:	23	: M-10	: 11+15.5B:	M-12-P :	4.00 :	0.00 :	0.000 :
:	24	: M-10	: 11+05.5B:	M-12-S :	0.00 :	0.00 :	0.000 :
:	25	: M-11	: 10+95.5B:	M-13-P :	10.00 :	0.00 :	0.000 :
:	26	: M-11	: 10+85.5B:	M-13-S :	10.00 :	0.00 :	0.000 :
:	27	: M-11	: 10+75.5B:	M-14-P :	10.00 :	0.00 :	0.000 :
:	28	: M-11	: 10+65.5B:	M-14-S :	10.00 :	0.00 :	0.000 :
:	29	: M-11	: 10+55.0B:	M-15-P :	10.00 :	0.00 :	0.000 :
:	30	: M-12	: 10+46.5B:	M-15-S :	10.00 :	0.00 :	0.000 :
:	31	: M-12	: 10+37.5B:	M-16-P :	10.00 :	0.00 :	0.000 :
:	32	: M-12	: 10+27.5B:	M-16-S :	10.00 :	0.00 :	0.000 :
:	33	: M-12	: 10+17.5B:	M-17-P :	10.00 :	0.00 :	0.000 :
:	34	: M-12	: 10+07.5B:	M-17-S :	10.00 :	0.00 :	0.000 :
:	35	: M-13	: 09+97.5B:	M-18-P :	10.00 :	0.00 :	0.000 :

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE II

#### MIDDLE WALL

NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
36	M-13	09+87.5B	M-18-S	10.00	0.00	0.000
37	M-13	09+77.5B	M-19-P	10.00	0.00	0.000
38	M-13	09+66.5B	M-19-S	10.00	0.00	0.000
39	M-13	09+57.5B	M-20-P	10.00	0.00	0.000
40	M-14	09+49.0B	M-20-S	10.00	0.00	0.000
41	M-14	09+37.5B	M-21-P	10.00	0.00	0.002
42	M-14	09+27.5B	M-21-S	10.00	0.00	0.000
43	M-14	09+17.5B	M-22-P	10.00	0.00	0.000
44	M-14	09+07.5B	M-22-S	10.00	0.00	0.006
45	M-15	08+97.5B	M-23-P	10.00	0.00	0.000
46	M-15	08+87.5B	M-23-S	10.00	0.00	0.046
47	M-25	04+78.5B	M-44-S	10.00	0.00	0.108
48	M-25	04+68.5B	M-45-P	10.00	0.00	0.002
49	M-25	04+58.5B	M-45-S	10.00	0.00	0.002
50	M-26	04+48.5B	M-46-P	10.00	0.00	0.284
51	M-26	04+39.0B	M-46-S	10.00	10.00	0.000
52	M-26	04+29.5B	M-47-P	10.00	0.00	0.000
53	M-26	04+20.0B	M-47-S	10.00	8.00	0.000
54	M-27	04+10.5B	M-48-P	10.00	0.00	0.000
55	M-27	04+01.0B	M-48-S	10.00	0.00	0.000
56	M-27	03+91.5B	M-49-P	10.00	0.00	0.000
57	M-27	03+82.0B	M-49-S	10.00	0.00	0.000
58	M-27	03+72.5B	M-50-P	10.00	0.00	0.000
59	M-28	03+63.5B	M-50-S	10.00	0.00	0.000
60	M-28	03+54.5B	M-51-P	10.00	0.00	0.000
61	M-28	03+45.5B	M-51-S	10.00	0.00	0.000
62	M-28	03+36.5B	M-52-P	10.00	0.00	0.000
63	M-29	03+26.5B	M-52-S	10.00	0.00	0.266
64	M-29	03+16.5B	M-53-P	10.00	0.00	0.000
65	M-29	03+06.5B	M-53-S	10.00	0.00	0.000
66	M-29	02+96.5B	M-54-P	10.00	0.00	0.000
67	M-29	02+86.5B	M-54-S	10.00	0.00	0.600
68	M-30	02+76.5B	M-55-P	10.00	0.00	0.000
69	M-30	02+66.5B	M-55-S	10.00	0.00	0.148
70	M-30	02+56.5B	M-56-P	10.00	0.00	0.000

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE II

#### MIDDLE WALL

NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
71	M-30	02+46.5B	M-56-S	10.00	0.00	0.000
72	M-30	02+36.5B	M-57-P	10.00	0.00	0.000
73	M-31	02+26.5B	M-57-S	10.00	0.00	0.000
74	M-31	02+16.5B	M-58-P	10.00	0.00	0.000
75	M-31	02+06.5B	M-58-S	10.00	0.00	0.002
76	M-31	01+96.5B	M-59-P	10.00	0.00	0.000
77	M-31	01+86.5B	M-59-S	10.00	0.00	0.000
78	M-32	01+76.5B	M-60-P	10.00	0.00	0.000
79	M-32	01+66.5B	M-60-S	10.00	0.00	0.202
80	M-32	01+56.5B	M-61-P	10.00	0.00	0.000
81	M-32	01+46.5B	M-61-S	10.00	0.00	0.000
82	M-32	01+36.5B	M-62-P	10.00	0.00	0.000
83	M-33	01+26.5B	M-62-S	10.00	0.00	0.000
84	M-33	01+16.5B	M-63-P	10.00	0.00	0.000
85	M-33	01+06.5B	M-63-S	10.00	0.00	0.000
86	M-33	00+96.5B	M-64-P	10.00	0.00	0.000
87	M-33	00+86.5B	M-64-S	10.00	0.00	0.000
88	M-34	00+76.5B	M-65-P	10.00	0.00	0.000
89	M-34	00+66.5B	M-65-S	10.00	0.00	0.000
90	M-34	00+56.5B	M-66-P	10.00	0.00	0.000
91	M-34	00+46.5B	M-66-S	10.00	0.00	0.000
92	M-34	00+36.5B	M-67-P	10.00	0.00	0.002
93	M-35	00+26.5B	M-67-S	10.00	0.00	0.000
94	M-35	00+16.5B	M-68-P	10.00	0.00	0.000
95	M-35	00+06.5B	M-68-S	10.00	0.00	0.000
96	M-35	00+03.5A	M-69-P	10.00	0.00	0.000
97	M-35	00+13.5A	M-69-S	10.00	0.00	0.000
98	M-36	00+23.5A	M-70-P	10.00	0.00	0.000
99	M-36	00+33.5A	M-70-S	10.00	0.00	0.000
100	M-36	00+41.5A	M-71-P	10.00	0.00	0.000
101	M-36	00+51.5A	M-71-S	10.00	0.00	0.002
102	M-36	00+61.5A	M-72-P	10.00	0.00	0.000
103	M-37	00+71.5A	M-72-S	10.00	0.00	0.000
104	M-37	00+81.5A	M-73-P	10.00	0.00	0.000
105	M-37	00+91.5A	M-73-S	10.00	0.00	0.600
						4.210
						0.180

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE II

#### MIDDLE WALL

NO.		STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
106	M-37	01+01.5A	M-74-P	10.00	0.00	0.004	0.230
107	M-37	01+11.5A	M-74-S	10.00	0.00	0.002	0.000
108	M-38	01+21.5A	M-75-P	10.00	0.00	0.000	0.000
109	M-38	01+25.0A	M-75-S	10.00	0.00	0.000	0.000
110	M-38	01+35.0A	M-76-P	10.00	0.00	0.000	0.000
111	M-38	01+35.0A	M-76-S	10.00	0.00	0.000	0.000
TOTALS				874.00	18.00	N/A	27.160

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### LAND WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	L-6	10+37.5B	L-01-P	7.00	16.00	0.000	0.000
2	L-6	10+27.5B	L-01-S	14.00	0.00	1.050	3.360
3	L-6	10+17.5B	L-02-P	14.50	0.00	0.000	0.000
4	L-6	10+07.5B	L-02-S	9.50	0.00	1.050	0.000
5	L-7	09+97.5B	L-03-P	18.00	0.00	0.164	1.110
6	L-7	09+87.5B	L-03-S	17.50	0.00	0.000	0.000
7	L-7	09+77.5B	L-04-P	16.50	0.00	0.772	7.210
8	L-7	09+66.5B	L-04-S	7.00	0.00	0.000	0.000
9	L-7	09+57.5B	L-05-P	7.50	0.00	0.000	0.000
10	L-8	09+47.5B	L-05-S	8.00	0.00	0.000	0.000
11	L-8	09+36.5B	L-06-P	8.50	0.00	0.000	0.000
12	L-8	09+26.5B	L-06-S	8.50	0.00	0.000	0.092
13	L-8	09+16.5B	L-07-P	8.00	0.00	0.000	0.000
14	L-8	09+07.5B	L-07-S	8.50	0.00	1.132	16.680
15	L-9	08+97.5B	L-08-P	7.50	0.00	0.002	0.000
16	L-9	08+87.5B	L-08-S	9.00	0.00	0.956	0.098
17	L-9	08+77.5B	L-09-P	9.00	0.00	0.000	0.000
18	L-9	08+66.5B	L-09-S	9.00	0.00	0.002	0.924
19	L-10	08+57.5B	L-10-P	9.00	0.00	0.003	0.000
20	L-10	08+47.5B	L-10-S	6.50	0.00	0.002	0.160
21	L-10	08+37.5B	L-11-P	6.00	0.00	0.000	0.000
22	L-10	08+27.5B	L-11-S	6.50	0.00	0.864	5.650
23	L-10	08+17.5B	L-12-P	7.00	0.00	0.000	0.000
24	L-11	82+07.5B	L-12-S	6.50	0.00	0.202	0.240
25	L-11	07+97.5B	L-13-P	10.50	0.00	0.000	0.000
26	L-11	07+87.5B	L-13-S	10.50	0.00	1.600	23.240
27	L-11	07+77.5B	L-14-P	9.00	0.00	0.100	1.320
28	L-11	07+67.5B	L-14-S	10.50	0.00	1.474	2.700
29	L-12	07+57.5B	L-15-P	9.00	0.00	0.002	0.000
30	L-12	07+47.5B	L-15-S	9.50	0.00	1.354	24.530
31	L-12	07+37.5B	L-16-P	8.00	0.00	0.002	0.000
32	L-12	07+28.0B	L-16-S	8.50	0.00	1.310	7.420
33	L-12	07+18.5B	L-17-P	10.00	0.00	0.002	0.000
34	L-13	07+08.5B	L-17-S	10.50	0.00	0.000	0.000
35	L-13	06+98.5B	L-18-P	8.00	0.00	0.004	0.000
36	L-13	06+92.0B	L-18-S	9.50	0.00	0.424	9.150
37	L-13	06+85.5B	L-19-P	7.00	0.00	0.000	0.000
				8.50	0.00	0.000	0.000

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### LAND WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
38	L-13	06+79.0B	L-19-S	10.00	0.00	0.000	0.000
39	L-13	06+72.5B	L-20-P	8.50	0.00	0.000	0.000
40	L-14	06+62.5B	L-20-S	9.00	0.00	0.002	0.000
41	L-14	06+52.5B	L-21-P	10.00	0.00	2.010	42.300
42	L-14	06+45.5B	L-21-S	9.00	0.00	0.000	0.000
43	L-14	06+32.5B	L-22-P	10.00	0.00	2.944	150.150
44	L-14	06+23.5B	L-22-S	11.50	0.00	0.000	0.000
45	L-15	06+14.5B	L-23-P	11.50	0.00	2.808	0.440
46	L-15	06+05.5B	L-23-S	11.50	0.00	0.396	13.690
47	L-15	05+96.5B	L-24-P	11.50	0.00	0.000	0.000
48	L-15	05+86.5B	L-24-S	11.50	0.00	1.440	8.580
49	L-15	05+76.5B	L-25-P	9.00	0.00	0.802	2.100
50	L-16	05+66.5B	L-25-S	10.50	0.00	0.000	0.000
51	L-16	05+56.5B	L-26-P	9.00	0.00	0.000	0.000
52	L-16	05+46.5B	L-26-S	8.00	0.00	0.002	0.000
53	L-16	05+36.5B	L-27-P	8.00	0.00	0.000	0.000
54	L-16	05+26.5B	L-27-S	8.00	0.00	0.002	0.000
55	L-17	05+16.5B	L-28-P	10.00	0.00	0.000	0.320
56	L-17	05+06.5B	L-28-S	10.00	0.00	0.000	0.000
57	L-17	04+96.5B	L-29-P	10.00	0.00	0.000	0.000
58	L-17	04+86.5B	L-29-S	10.00	0.00	0.000	0.000
59	L-18	04+76.5B	L-30-P	10.00	0.00	0.000	0.000
60	L-18	04+66.5B	L-30-S	8.50	0.00	0.346	2.960
61	L-18	04+56.5B	L-31-P	7.50	0.00	0.000	0.000
62	L-18	04+46.5B	L-31-S	NOT DRILLABLE			
63	L-18	04+41.5B	L-31ST	4.00	0.00	0.000	0.000
64	L-18	04+51.5B	L-31PT	4.00	0.00	0.000	0.000
65	L-18	04+36.5B	L-32-P	8.50	0.00	0.002	0.000
66	L-19	04+26.5B	L-32-S	8.50	0.00	0.000	0.000
67	L-19	04+16.5B	L-33-P	10.50	0.00	0.000	0.000
68	L-19	04+06.5B	L-33-S	10.00	0.00	0.000	0.000
69	L-19	03+96.5B	L-34-P	8.50	0.00	0.000	0.000
70	L-19	03+86.5B	L-34-S	8.00	0.00	0.000	0.000
71	L-20	03+76.5B	L-35-P	8.50	0.00	0.002	0.000
72	L-20	03+66.5B	L-35-S	8.00	0.00	0.000	0.000
73	L-20	03+56.5B	L-36-P	8.00	0.00	0.000	0.000
74	L-20	03+46.5B	L-36-S	7.00	0.00	0.000	0.000

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE I

#### LAND WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
75	L-20	03+36.5B	L-37-P	7.50	0.00	0.000	0.000
76	L-21	03+26.5B	L-37-S	8.00	0.00	0.000	0.000
77	L-21	03+16.5B	L-38-P	8.50	0.00	0.000	0.000
78	L-21	03+06.5B	L-38-S	8.00	0.00	0.384	6.660
79	L-21	02+96.5B	L-39-P	8.00	0.00	0.000	0.000
80	L-21	02+86.5B	L-39-S	7.50	0.00	0.130	0.720
81	L-22	02+76.5B	L-40-P	7.00	0.00	0.000	0.000
82	L-22	02+66.5B	L-40-S	7.50	0.00	0.000	0.125
83	L-22	02+56.5B	L-41-P	7.00	0.00	0.000	0.000
84	L-22	02+46.5B	L-41-S	7.50	0.00	0.000	0.000
85	L-22	02+36.5B	L-42-P	7.50	0.00	0.116	0.000
86	L-22	02+26.5B	L-42-S	8.00	0.00	0.028	0.000
87	L-23	02+16.5B	L-43-P	7.00	0.00	0.000	0.000
88	L-23	02+06.5B	L-43-S	7.00	0.00	0.250	2.400
89	L-23	01+96.5B	L-44-P	7.00	0.00	0.000	0.000
90	L-23	01+86.5B	L-44-S	7.00	0.00	0.000	0.000
91	L-24	01+76.5B	L-45-P	7.50	0.00	0.000	0.000
TOTALS				802.5	16.00	N/A	334.329

## LAND WALL

12-0.3-4

## LAND WALL

12-0.3-5

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE II ZONE II

#### LAND WALL

NO.	MONO NO.	STATION NO.	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
75	L-20	03+36.5B	L-37-P	10.00	0.00	0.000	0.00
76	L-21	03+26.5B	L-37-S	10.00	0.00	0.040	0.00
77	L-21	03+16.5B	L-38-P	10.00	10.00	0.000	0.00
78	L-21	03+06.5B	L-38-S	10.00	0.00	0.000	0.00
79	L-21	02+96.5B	L-39-P	10.00	0.00	0.000	0.00
80	L-21	02+86.5B	L-39-S	10.00	0.00	0.000	0.00
81	L-22	02+76.5B	L-40-P	10.00	0.00	0.000	0.00
82	L-22	02+66.5B	L-40-S	10.00	0.00	0.000	0.00
83	L-22	02+56.5B	L-41-P	10.00	0.00	0.020	0.00
84	L-22	02+46.5B	L-41-S	10.00	0.00	0.000	0.00
85	L-22	02+36.5B	L-42-P	10.00	5.00	0.124	0.00
86	L-23	02+26.5B	L-42-S	10.00	5.00	0.000	0.00
87	L-23	02+16.5B	L-43-P	10.00	0.00	0.135	0.00
88	L-23	02+06.5B	L-43-S	10.00	5.00	0.000	0.00
89	L-23	01+96.5B	L-44-P	10.00	0.00	0.000	0.00
90	L-23	01+86.5B	L-44-S	10.00	0.00	0.000	0.00
91	L-24	01+76.5B	L-45-P	8.50	0.00	0.000	0.00
TOTALS				820.00	238.00	N/A	6.92

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE III ZONE I

#### U/S M/L MITER GATE

NO.	MONO FROM	STATION OFFSET	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	W/OC/S	68'-6.0"	UMMS-01-S	10.00	0.00	0.000	0.000
2	W/OC/S	58'-6.0"	UMMS-01-P	13.00	0.00	0.010	0.000
3	W/OC/S	43'-0.5"	UMMS-02-S	14.00	0.00	0.020	0.000
4	W/OC/S	38'-6.0"	UMMS-02-P	14.00	0.00	0.130	0.000
5	W/OC/S	29'-3.0"	UMMS-03-S	14.00	0.00	0.060	0.000
6	W/OC/S	20'-0.0"	UMMS-03-P	13.00	0.00	0.120	0.000
7	W/OC/S	10'-0.0"	UMMS-04-S	14.00	0.00	0.004	0.000
8	W/OC/S	CENTER	UMMS-04-P	14.00	0.00	0.002	0.000
9	CENTER	10'-0.0"	UMMS-05-S	14.00	0.00	0.006	0.000
10	E/OC/S	20'-0.0"	UMMS-05-P	14.00	0.00	0.062	0.000
11	E/OC/S	29'-8.0"	UMMS-06-S	14.00	0.00	0.146	0.000
12	E/OC/S	39'-7.0"	UMMS-06-P	14.00	0.00	0.000	0.000
13	E/OC/S	49'-7.0"	UMMS-07-S	14.00	0.00	0.120	0.000
14	E/OC/S	59'-7.0"	UMMS-07-P	14.00	0.00	0.000	0.000
15	E/OC/S	69'-7.0"	UMMS-08-S	13.00	0.00	0.020	0.000
16							
TOTALS				203.00	0.000	N/A	0.000

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE III ZONE II

#### U/S M/L MITER GATE

NO.	MONO FROM	STATION OFFSET	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	W/OC/S	68'-6.0"	UMMS-01-S	10.00	0.00	0.000	0.00
2	W/OC/S	58'-6.0"	UMMS-01-P	10.00	0.00	0.022	0.00
3	W/OC/S	43'-0.5"	UMMS-02-S	10.00	0.00	0.024	0.00
4	W/OC/S	38'-6.0"	UMMS-02-P	10.00	0.00	0.140	0.00
5	W/OC/S	29'-3.0"	UMMS-03-S	10.00	0.00	0.082	0.00
6	W/OC/S	20'-0.0"	UMMS-03-P	10.00	0.00	0.164	0.00
7	W/OC/S	10'-0.0"	UMMS-04-S	10.00	0.00	0.000	0.00
8	W/OC/S	CENTER	UMMS-04-P	10.00	0.00	0.066	0.00
9	CENTER	10'-0.0"	UMMS-05-S	10.00	0.00	0.008	0.00
10	E/OC/S	20'-0.0"	UMMS-05-P	10.00	0.00	0.084	0.00
11	E/OC/S	29'-8.0"	UMMS-06-S	10.00	0.00	0.230	0.00
12	E/OC/S	39'-7.0"	UMMS-06-P	10.00	0.00	0.002	0.00
13	E/OC/S	49'-7.0"	UMMS-07-S	10.00	0.00	0.164	0.00
14	E/L-6	59'-7.0"	UMMS-07-P	10.00	0.00	0.018	0.00
15	E/L-6	69'-7.0"	UMMS-08-S	10.00	0.00	0.020	0.00
TOTALS				150.00	0.00	N/a	0.00

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE III ZONE I

#### U/S M/L EMG SILL

=====							
:	:	MONO	:	STATION	:	:	:
:	:	OFFSET	:	10+37.5B: HOLE	:	:	:
:	NO.	FROM	:	OFFSET	:	DRILL	REDRILL: PRESS : GROUT :
:	:	:	:	NO.	:	FOOTAGE:	FOOTAGE: TEST : CWT :
=====							
:	1	: W/OC/S	:	65'-0.0"	:	UMES-01-S:	14.00 : 0.00 : 0.000 : 0.00 :
:	2	: W/OC/S	:	55'-0.0"	:	UMES-01-P:	14.00 : 0.00 : 0.008 : 0.00 :
:	3	: W/OC/S	:	50'-0.0"	:	UMES-02-S:	14.00 : 0.00 : 0.030 : 0.00 :
:	4	: W/OC/S	:	40'-0.0"	:	UMES-02-P:	13.00 : 0.00 : 0.044 : 0.00 :
:	5	: W/OC/S	:	30'-0.0"	:	UMES-03-S:	14.00 : 0.00 : 0.074 : 0.00 :
:	6	: W/OC/S	:	20'-0.0"	:	UMES-03-P:	13.00 : 0.00 : 0.074 : 0.00 :
:	7	: W/OC/S	:	10'-0.0"	:	UMES-04-S:	14.00 : 0.00 : 0.114 : 0.00 :
:	8	: CENTER	:	0.0'-0.0"	:	UMES-04-P:	14.00 : 0.00 : 0.010 : 0.00 :
:	9	: E/OC/S	:	10'-0.0"	:	UMES-05-S:	14.00 : 0.00 : 0.080 : 0.00 :
:	10	: E/OC/S	:	20'-0.0"	:	UMES-05-P:	13.00 : 0.00 : 0.066 : 0.00 :
:	11	: E/OC/S	:	30'-0.0"	:	UMES-06-S:	14.00 : 0.00 : 0.004 : 0.00 :
:	12	: E/OC/S	:	40'-0.0"	:	UMES-06-P:	14.00 : 0.00 : 0.020 : 0.00 :
:	13	: E/OC/S	:	50'-0.0"	:	UMES-07-S:	14.00 : 0.00 : 0.000 : 0.00 :
:	14	: E/OC/S	:	55'-4.0"	:	UMES-07-P:	14.00 : 0.00 : 0.000 : 0.00 :
:	15	: E/OC/S	:	70'-2.0"	:	UMES-08-S:	10.00 : 0.00 : 0.000 : 0.00 :
:	16	:	:	:	:	:	0.00 : 0.000 : 0.00 :
=====							
:	TOTALS				:	203.00	0.00 : N/A : 0.00 :
=====							

GALLIPOLIS LOCK AND DAM

DRILLING & GROUTING

PHASE III ZONE II

U/S M/L EMG SILL

=====							
:	:	MONO	:	STATION	:	:	:
:	:	OFFSET	:	10+37.5B: HOLE	:	DRILL	:
:	NO.:	FROM	:	OFFSET	:	FOOTAGE:	FOOTAGE:
:	:	:	:	NO.	:	TEST	:
:	:	:	:	:	:	CWT	:
=====							
:	1	:	W/OC/S	:	65'-0.0": UMES-01-S:	10.00	:
:	2	:	W/OC/S	:	55'-0.0": UMES-01-P:	10.00	:
:	3	:	W/OC/S	:	50'-0.0": UMES-02-S:	10.00	:
:	4	:	W/OC/S	:	40'-0.0": UMES-02-P:	10.00	:
:	5	:	W/OC/S	:	30'-0.0": UMES-03-S:	10.00	:
:	6	:	W/OC/S	:	20'-0.0": UMES-03-P:	10.00	:
:	7	:	W/OC/S	:	10'-0.0": UMES-04-S:	10.00	:
:	8	:	CENTER	:	0.0'-0.0": UMES-04-P:	10.00	:
:	9	:	E/OC/S	:	10'-0.0": UMES-05-S:	10.00	:
:	10	:	E/OC/S	:	20'-0.0": UMES-05-P:	10.00	:
:	11	:	E/OC/S	:	30'-0.0": UMES-06-S:	10.00	:
:	12	:	E/OC/S	:	40'-0.0": UMES-06-P:	10.00	:
:	13	:	E/OC/S	:	50'-0.0": UMES-07-S:	10.00	:
:	14	:	E/OC/S	:	55'-4.0": UMES-07-P:	10.00	:
:	15	:	E/OC/S	:	70'-2.0": UMES-08-S:	10.00	:
:	16	:	:	:	:	:	:
=====							
:	TOTALS				:	150.00	:
:					:	0.00	:
:					:	N/A	:
:					:	1.82	:
=====							

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE III ZONE I

#### U/S AUX MITER GATE

=====							
:	:	MONO	:	STATION	:	:	:
:	:	OFFSET	:	10+37.5B: HOLE	:	DRILL	:
:	NO.	FROM	:	OFFSET	:	FOOTAGE:	REDRILL: PRESS : GROUT :
:	:	:	:	NO.	:	FOOTAGE:	FOOTAGE: TEST : CWT :
=====							
:	1	: W/OC/S	:	70'-0.0"	:	UAMS-01-S:	10.00 : 0.00 : 0.922 : 26.57 :
:	2	: W/OC/S	:	60'-0.0"	:	UAMS-01-P:	10.00 : 0.00 : 0.042 : 0.00 :
:	3	: W/OC/S	:	50'-0.0"	:	UAMS-02-S:	12.00 : 0.00 : 0.760 : 17.90 :
:	4	: W/OC/S	:	40'-0.0"	:	UAMS-02-P:	11.00 : 0.00 : 0.272 : 0.41 :
:	5	: W/OC/S	:	30'-0.0"	:	UAMS-03-S:	11.00 : 0.00 : 0.240 : 0.52 :
:	6	: W/OC/S	:	20'-0.0"	:	UAMS-03-P:	13.00 : 0.00 : 0.072 : 0.00 :
:	7	: W/OC/S	:	10'-0.0"	:	UAMS-04-S:	13.00 : 0.00 : 0.192 : 1.83 :
:	8	: CENTER	:	CENTER	:	UAMS-04-P:	13.00 : 0.00 : 0.260 : 2.91 :
:	9	: E/OC/S	:	10'-0.0"	:	UAMS-05-S:	13.00 : 0.00 : 0.058 : 0.00 :
:	10	: E/OC/S	:	20'-0.0"	:	UAMS-05-P:	15.00 : 0.00 : 0.016 : 0.13 :
:	11	: E/OC/S	:	29'-0.5"	:	UAMS-06-S:	12.00 : 0.00 : 0.020 : 0.00 :
:	12	: E/OC/S	:	38'-0.01"	:	UAMS-06-P:	13.00 : 0.00 : 1.488 : 14.45 :
:	13	: E/OC/S	:	50'-0.1"	:	UAMS-07-S:	13.00 : 0.00 : 0.186 : 2.63 :
:	14	: E/OC/S	:	58'-0.1"	:	UAMS-07-P:	8.00 : 0.00 : 0.004 : 0.00 :
:	15	: E/OC/S	:	68'-0.0"	:	UAMS-08-S:	18.00 : 0.00 : 0.000 : 0.00 :
:	16	: E/OC/S	:	61'-0.0"	:	UAMS-7-PT:	10.00 : 0.00 : 0.000 : 0.00 :
:	17	: E/OC/S	:	63'-0.0"	:	UAMS-8-ST:	10.00 : 0.00 : 0.000 : 0.00 :
=====							
:	TOTALS				:	205.00	: 0.00 : N/A : 67.35 :
:					:		: : : :
=====							

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE III ZONE II

#### U/S AUX MITER GATE

=====							
:	:	MONO	:	STATION	:	:	:
:	:	OFFSET	:	02+76.5B: HOLE	:	DRILL	:
:	NO.	FROM	:	OFFSET NO.	:	FOOTAGE:	REDRILL: PRESS : GROUT :
:	:	:	:	:	:	FOOTAGE:	TEST : CWT :
=====							
:	1	: W/OC/S	:	70'-0.0"	:	UAMS-01-S:	10.00 : 21.00 : 0.000 : 0.00 :
:	2	: W/OC/S	:	60'-0.0"	:	UAMS-01-P:	10.00 : 0.00 : 0.000 : 0.00 :
:	3	: W/OC/S	:	52'-0.0"	:	UAMS-02-S:	10.00 : 0.00 : 0.000 : 0.00 :
:	4	: W/OC/S	:	40'-0.0"	:	UAMS-02-P:	10.00 : 0.00 : 0.000 : 0.00 :
:	5	: W/OC/S	:	30'-0.0"	:	UAMS-03-S:	10.00 : 0.00 : 0.000 : 0.00 :
:	6	: W/OC/S	:	20'-0.0"	:	UAMS-03-P:	10.00 : 0.00 : 0.066 : 0.00 :
:	7	: W/OC/S	:	10'-0.0"	:	UAMS-04-S:	10.00 : 0.00 : 0.008 : 0.00 :
:	8	: CENTER	:	0.0'-0.0"	:	UAMS-04-P:	10.00 : 0.00 : 0.000 : 0.00 :
:	9	: E/OC/S	:	10'-0.0"	:	UAMS-05-S:	10.00 : 0.00 : 0.230 : 0.68 :
:	10	: E/OC/S	:	20'-0.0"	:	UAMS-05-P:	10.00 : 0.00 : 0.006 : 0.00 :
:	11	: E/OC/S	:	29'-0.5"	:	UAMS-06-S:	10.00 : 0.00 : 0.090 : 0.00 :
:	12	: E/OC/S	:	38'-1.0"	:	UAMS-06-P:	10.00 : 0.00 : 0.000 : 0.00 :
:	13	: E/OC/S	:	50'-1.0"	:	UAMS-07-S:	10.00 : 0.00 : 0.126 : 0.63 :
:	14	: E/OC/S	:	58'-1.0"	:	UAMS-07-P:	10.00 : 0.00 : 0.002 : 0.00 :
:	15	: E/OC/S	:	68'-0.0"	:	UAMS-08-S:	0.00 : 0.00 : N/A : 0.00 :
:	16	: E/OC/S	:	61'-0.0"	:	UAMS-7-PT:	10.00 : 0.00 : 0.000 : 0.00 :
:	17	: E/OC/S	:	63'-0.0"	:	UAMS-8-ST:	10.00 : 0.00 : 0.000 : 0.00 :
=====							
:	TOTALS				:	160.00	: 21.00 : N/A : 1.31 :
:					:		: : : :
=====							

# GALLIPOLIS LOCK AND DAM

## DRILLING & GROUTING

### PHASE III ZONE I

#### U/S AUX EMG SILL

NO.	MONO FROM	STATION OFFSET	HOLE NO.	DRILL FOOTAGE	REDRILL FOOTAGE	PRESS TEST	GROUT CWT
1	W/OC/S	69'-0.0"	UAES-01-S:	10.00	0.00	0.006	0.00
2	W/OC/S	59'-0.0"	UAES-01-P:	10.00	0.00	0.076	0.00
3	W/OC/S	49'-0.0"	UAES-02-S:	8.00	0.00	0.000	0.00
4	W/OC/S	39'-0.0"	UAES-02-P:	8.00	0.00	0.000	0.00
5	W/OC/S	27'-0.5"	UAES-03-S:	8.00	0.00	0.002	0.00
6	W/OC/S	19'-0.0"	UAES-03-P:	8.00	0.00	0.006	0.00
7	W/OC/S	09'-6.0"	UAES-04-S:	8.00	0.00	0.006	0.00
8	CENTER	0.0'-0.0"	UAES-04-P:	8.00	0.00	0.016	0.00
9	E/OC/S	09'-6.0"	UAES-05-S:	8.00	0.00	0.068	0.00
10	E/OC/S	19'-0.0"	UAES-05-P:	8.00	0.00	0.004	0.00
11	E/OC/S	29'-0.0"	UAES-06-S:	8.00	0.00	0.106	0.00
12	E/OC/S	39'-0.0"	UAES-06-P:	8.00	0.00	0.110	0.00
13	E/OC/S	49'-0.0"	UAES-07-S:	8.00	0.00	0.038	0.00
14	E/OC/S	59'-0.0"	UAES-07-P:	8.00	0.00	0.000	0.00
15	E/OC/S	69'-2.0"	UAES-08-S:	0.00	0.00	N/A	0.00
16	E/OC/S	54'-0.5"	UAES-7-PT:	8.00	0.00	0.000	0.00
17	E/OC/S	62'-0.2"	UAES-8-ST:	8.00	0.00	0.000	0.00
TOTALS				132.00	0.00	N/A	0.00

GALLIPOLIS LOCK AND DAM

DRILLING & GROUTING

PHASE III ZONE II

U/S AUX EMG SILL

=====							
:	:	MONO	:	STATION	:	:	:
:	:	OFFSET	:	10+37.5B: HOLE	:	DRILL	:
:	NO.	FROM	:	OFFSET	:	FOOTAGE:	FOOTAGE: PRESS: GROUT
:	:	:	:	NO.	:	TEST	:
:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:
:	1	W/OC/S	:	69'-0.0"	:	UAES-01-S:	10.00 : 0.00 : 0.00 : 0.00
:	2	W/OC/S	:	59'-0.0"	:	UAES-01-P:	10.00 : 0.00 : 0.00 : 0.00
:	3	W/OC/S	:	49'-0.0"	:	UAES-02-S:	10.00 : 0.00 : 0.00 : 0.00
:	4	W/OC/S	:	39'-0.0"	:	UAES-02-P:	10.00 : 0.00 : 0.00 : 0.00
:	5	W/OC/S	:	27'-0.5"	:	UAES-03-S:	10.00 : 0.00 : 0.01 : 0.00
:	6	W/OC/S	:	19'-0.0"	:	UAES-03-P:	10.00 : 0.00 : 0.04 : 0.00
:	7	W/OC/S	:	09'-6.0"	:	UAES-04-S:	10.00 : 0.00 : 0.06 : 0.00
:	8	CENTER	:	0.0'-0.0"	:	UAES-04-P:	10.00 : 0.00 : 0.01 : 0.00
:	9	E/OC/S	:	09'-6.0"	:	UAES-05-S:	10.00 : 0.00 : 0.15 : 0.03
:	10	E/OC/S	:	19'-0.0"	:	UAES-05-P:	10.00 : 0.00 : 0.02 : 0.18
:	11	E/OC/S	:	29'-0.0"	:	UAES-06-S:	10.00 : 0.00 : 0.28 : 4.94
:	12	E/OC/S	:	39'-0.0"	:	UAES-06-P:	10.00 : 0.00 : 0.21 : 7.86
:	13	E/OC/S	:	49'-0.0"	:	UAES-07-S:	10.00 : 0.00 : 1.69 : 1.45
:	14	E/OC/S	:	59'-0.0"	:	UAES-07-P:	N/A : N/A : N/A : N/A
:	15	E/OC/S	:	69'-2.0"	:	UAES-08-S:	10.00 : 0.00 : 0.00 : 0.00
:	16	E/OC/S	:	54'-0.5"	:	UAES-7-PT:	10.00 : 0.00 : 0.00 : 0.00
:	17	E/OC/S	:	62'-0.2"	:	UAES-8-ST:	10.00 : 0.00 : 0.00 : 0.00
=====							
:	TOTAL				:	160.00	: 0.00 : N/A : 14.45
:					:		: : : :
=====							

## Appendix

### Section XIII

SECTION	TITLE	PAGE
(Q)	Modifications	13-Q-1 TO 13-Q-29
(R)	Contractor's Letters	13-R-1 TO 13-R-81
(S)	Government Letters	13-S-1 TO 13-S-22
(T)	Request for clarification (RFC'S)	13-T-1 TO 13-T-35

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J</b>				1. CONTRACT ID CODE	PAGE OF PAGE 1   2
2. AMENDMENT/MODIFICATION NO. P00007	3. EFFECTIVE DATE 5-12-88	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)		
ISSUED BY S. Army Engineer District, Huntington Corps of Engineers 502 8th Street Huntington, West Virginia 25701-2070		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) G L R Constructors P. O. Box "T" Point Pleasant, West Virginia 25550				9A. AMENDMENT OF SOLICITATION NO.	
				9B. DATED (SEE ITEM 11)	
				10A. MODIFICATION OF CONTRACT/ORD. NO. DACW69-88-C-0001	
				10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE			

### 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:  
(a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

### 12. ACCOUNTING AND APPROPRIATION DATA (If required)

06X3122 CG FSN 96461 MG BB GAL 05 50 AO 0000 0320 284

### 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying off, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	Contract Clause 59 - Changes
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible). Reference is made to the above contract for: Locks in Canal, Gallipolis Locks & Dam, Ohio. The use of A328 steel in lieu of A572 steel for the PSA23 sheet pile in the temporary cutoff which ties into the temporary sheet pile cells is incorporated into the contract. This modification was previously identified as Change BJ. This modification will result in the addition of one new item. The payment for this item to be made at the agreed lump sum price hereby established as indicated below:

Item No.	Description	Estimated Quantity	Unit	Unit Price	Decrease Amount
P00007-1	Steel sheet Piling ASTM A328 in lieu of A572	1	JOB	SUM	\$2,835

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

NAME AND TITLE OF SIGNER (Type or print) VID EY URBAN PROJECT MANAGER		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) RONALD C. HARRIS RESIDENT CONTRACTING OFFICER	
15B. CONTRACTOR/OFFEROR <i>[Signature]</i> (Signature of person authorized to sign)	15C. DATE SIGNED 5/14/88	16B. UNITED STATES OF AMERICA BY (Signature of Contracting Officer)	16C. DATE SIGNED 5-12-88

Page 2 of 2  
Contract No. DACW69-88-C-0001  
Modification P00007

The total contract price is reduced by \$2,835.00. The total contract completion date remains unchanged.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all cost and markups directly or indirectly attributable to the change ordered herein, for all delays related thereto and for performance of the changes within the time frame stated.

RECEIVED  
MAY 13 1988  
GLR

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J				1. CONTRACT ID CODE	PAGE OF PAGE 1   2
2. AMENDMENT/MODIFICATION NO. 009		3. EFFECTIVE DATE 6/8/88		4. REQUISITION/PURCHASE REQ. NO.	
5. PROJECT NO. (If applicable)		6. ADMINISTERED BY (If other than Item 6)		CODE	
7. U.S. Army Engineer District, Huntington Corps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070					
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)					
G L R Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550					
9. AMENDMENT OF SOLICITATION NO.					
9B. DATED (SEE ITEM 11) 87OCT23					
10A. MODIFICATION OF CONTRACT/ORDER NO. DACW69-88-C-0001					
10B. DATED (SEE ITEM 13) 87OCT23					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended.					
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required) 3122 CG; FSN 96461; MG BB GAL 05.50AO 0000 0320 284					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.					
<input type="checkbox"/> A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
<input type="checkbox"/> B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).					
<input checked="" type="checkbox"/> C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
<input checked="" type="checkbox"/> Contract Clause 59 - "Changes"					
<input type="checkbox"/> D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)					
Reference is made to the above contract for: Locks in Canal, Gallipolis Locks and Dam, Ohio River. The addition of two (2) pounds of calcium hypochlorite per ton of backfill in the predrainage wells is incorporated into the contract.					
This modification was previously identified as Change AK.					
This modification will result in the addition of one new item. The payment for this item will be made at the agreed lump sum price hereby established as indicated below:					
Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount
P00009-1	Disinfection of Predrainage Wells	1	Job	Sum	\$2,700.00
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15B. CONTRACTOR/OFFEROR David E. Urban, Project Manager			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Ronald C. Harris, Resident Contracting Officer		
15C. DATE SIGNED 6/16/88			16B. UNITED STATES OF AMERICA BY <i>Ronald C. Harris</i> (Signature of Contracting Officer)		
15D. CONTRACTOR/OFFEROR <i>David E. Urban</i> (Signature of person authorized to sign)			16C. DATE SIGNED 8 June 1988		

NSN 7540-01-152-8070  
PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-0-3

Page 2 of 2

Contract No. DACW69-88-C-0001

Modification No. P00009

The total contract price is increased by \$2,700.00. The total contract completion date remains unchanged.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and markups directly or indirectly attributable to the change ordered herein, for all delays related thereto, and for performance of the changes within the time frame stated.



RECEIVED

JUN 15 1988

GLK

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>				1. CONTRACT ID CODE		PAGE OF PAGE													
2. AMENDMENT/MODIFICATION NO. <b>P0001 3</b>		3. EFFECTIVE DATE <b>7-18-88</b>		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable) <b>1 2</b>													
6. ISSUED BY <b>US Army Engineer District, Huntington Corps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070</b>		CODE		7. ADMINISTERED BY (If other than Item 6)		CODE													
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) <b>GLR Constructors PO Box "T" Pt. Pleasant, West Virginia 25550</b>				(f) 9A. AMENDMENT OF SOLICITATION NO.															
				9B. DATED (SEE ITEM 11)															
				10A. MODIFICATION OF CONTRACT/ORDER NO. <b>DACW69-88-C-0001</b>															
				10B. DATED (SEE ITEM 13) <b>87 OCT 23</b>															
CODE		FACILITY CODE		11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS															
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.																			
12. ACCOUNTING AND APPROPRIATION DATA (If required) <b>96X3122 CG FSN 96461 MG BB GAL 05 50A0 0000 0320 284</b>																			
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.																			
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.																			
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying off, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).																			
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:																			
X <b>Contract Clause 59 "Changes"</b>																			
D. OTHER (Specify type of modification and authority)																			
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.																			
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Reference is made to the above contract for: <b>Locks in Canal, Gallipolis Locks and Dam, Ohio River.</b> The installation of seven additional piezometers is incorporated into the contract. The locations of these piezometers shall be directed by the Resident Engineer. The piezometer will be installed and read in accordance with plans and specifications for the original contract. This modification was previously referred to as Change AV. This modification will result in the addition of one new item. The payment for this item will be made at the agreed lump sum price hereby established as indicated below:																			
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Item No.</th> <th>Description</th> <th>Estimated Quantity</th> <th>Unit</th> <th>Unit Price</th> <th>Amount</th> </tr> </thead> <tbody> <tr> <td><b>P00010-1</b></td> <td><b>Seven Additional Piezometers</b></td> <td><b>1</b></td> <td><b>Job</b></td> <td><b>Sum</b></td> <td><b>\$28,297.00</b></td> </tr> </tbody> </table>								Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount	<b>P00010-1</b>	<b>Seven Additional Piezometers</b>	<b>1</b>	<b>Job</b>	<b>Sum</b>	<b>\$28,297.00</b>
Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount														
<b>P00010-1</b>	<b>Seven Additional Piezometers</b>	<b>1</b>	<b>Job</b>	<b>Sum</b>	<b>\$28,297.00</b>														
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.																			
15A. NAME AND TITLE OF SIGNER (Type or print) <b>DAVID E. URBAN - PROJECT MANAGER</b>				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) <b>RONALD C. HARRIS RESIDENT CONTRACTING OFFICER</b>															
15C. DATE SIGNED <b>7/19/88</b>				16C. DATE SIGNED <b>7-18-88</b>															
15B. UNITED STATES OF AMERICA BY <i>(Signature of Contracting Officer)</i>				16B. UNITED STATES OF AMERICA BY <i>(Signature of Contracting Officer)</i>															

NSN 7540-01-152-8070  
PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10-2)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-8-5

Page 2 of 2  
Contract No. DACW69-88-C-0001  
Modification P00013

The total contract price is increased by \$ 28,297.00. The total contract time remains unchanged.

This adjustment constitutes compensation in full on the behalf of the contractor and its subcontractor and suppliers for all cost and markups directly and indirectly attributable to the change ordered herein, for all delays thereto and for performance of the changes within the time frame stated.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE	PAGE OF PAGE
2. AMENDMENT/MODIFICATION NO. P00032	3. EFFECTIVE DATE 89FEB23	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)		
6. ISSUED BY U.S. Army Engineer District, Huntington rps of Engineers J2 Eighth Street Huntington, West Virginia 25701-2070		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  GLR Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550				9A. AMENDMENT OF SOLICITATION NO.	
				9B. DATED (SEE ITEM 11)	
				10A. MODIFICATION OF CONTRACT/ORDER NO. DACW69-88-C-0001	
				10B. DATED (SEE ITEM 13) 87 OCT 23	
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required) FSN 96461 96X3122 CG MG BB GAL 05 50A0 0000 0320 284					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.					
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).					
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
X Clause 59 "Changes" and Clause 64 "Value Engineering Construction"					
D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Reference is made to the above contract for: Locks in Canal, Gallipolis Locks and Dam, Ohio River, West Virginia.  It has been determined that Value Engineering Proposal No. 7, "Revised Slurry Wall Cap" is acceptable to the government and since an equitable adjustment in the contract price has been determined for the resulting change, it is necessary to modify the contract accordingly.  The installation of the specified slurry trench cap is hereby deleted except in those areas where the slurry trench is under an access or haul road.  The slurry trench cap shall be installed as shown in the drawings and as specified in those Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15A. NAME AND TITLE OF SIGNER (Type or print) DAVID E. URBAN PROJECT MANAGER			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) THOMAS E. FAREWELL Colonel, Corps of Engineers		
15B. CONTRACTOR/OFFEROR <i>David E. Urban</i> (Signature of person authorized to sign)			15C. DATE SIGNED 03/22/89		16B. UNITED STATES OF AMERICA BY <i>Thomas E. Farewell</i> (Signature of Contracting Officer)
					16C. DATE SIGNED 6 MAR 89

NSN 7540-01-152-8070  
PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10-8-80)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-8-7

areas where the slurry trench is under any permanent roads, temporary access roads and where any haul roads intersect the slurry trench.

If in those areas where the cap is eliminated, additional maintenance is required, it will be performed at no additional costs to the government.

This modification was formerly referred to as Change "BL", "Value Engineering Proposal No. 7".

Payment for all costs and credits for the changed work will be made at the agreed prices hereby established and listed below:

<u>Item No.</u>	<u>Description</u>	<u>Qty</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>	
					<u>Increase</u>	<u>Decrease</u>
P00032-1	VE No. 7 - Revise Slurry Wall Cap	1	JOB	SUM		\$57,777.78
P00032-2	VECP Incentive Adjustment Paid to the Contractor	1	JOB	SUM	\$31,777.78	

Net Decrease to Contract Amount - \$26,000.00

The contract amount is decreased by \$26,000.00. The contract performance time remains unchanged.

It is also understood and agreed that this adjustment constitutes compensation in full on behalf of the Contractor and its subcontractors and suppliers, for all costs and mark-ups directly and indirectly attributable to the change ordered herein.

If the foregoing modification is acceptable, it is requested that you complete Blocks 15A and 15C, sign in Block 15B of the form, and return the original to this office (ATTN: CEORH-CT).

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J				1. CONTRACT ID CODE	PAGE OF PAGES 1   2
2. AMENDMENT/MODIFICATION NO. D00096		3. EFFECTIVE DATE 21MAY90		4. REQUISITION/PURCHASE REQ. NO.	
5. PROJECT NO. (If applicable) GT		6. ADMINISTERED BY (If other than Item 5)			
7. ADMINISTERED BY (If other than Item 5)		CODE			
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) GLR Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550					
9A. AMENDMENT OF SOLICITATION NO.					
9B. DATED (SEE ITEM 11)					
10A. MODIFICATION OF CONTRACT/ORDER NO. X DACW69-88-C-0001					
10B. DATED (SEE ITEM 13) 87 OCT 23					
CODE		FACILITY CODE			
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required) MG GP GAL 05 50A0 0000 0320 284 (50%) 96461 96Y3122 CG MG BB GAL 05 50A0 0000 0320 284 (50%)					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.					
<input checked="" type="checkbox"/> A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. <input type="checkbox"/> B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b). <input type="checkbox"/> C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: <input checked="" type="checkbox"/> Contract Clause 62 - "Inspection of Construction" <input type="checkbox"/> D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office. 14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Refer to the above contract for: Locks in Canal, Gallipolis Locks and Dam, Ohio River, West Virginia. The payment for the concrete cores taken to inspect the questionable integrity of the concrete in monoliths R-19, L-28, R-27, R-37, R-41, M-35, and M-24 is hereby incorporated into the contract.  This modification was formerly referred to as Change "GT."  The payment for this modification will require the addition of one new item. The payment for this item will be made in accordance with the following price schedule:					
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
NAME AND TITLE OF SIGNER (Type or print)			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
			THOMAS E. FAREWELL Colonel, Corps of Engineers Contracting Officer		
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA	
(Signature of person authorized to sign)				(Signature of Contracting Officer)	
				16C. DATE SIGNED 4 Jun 90	

Page 2 of 2  
Contract No. DACW69-88-C-0001  
Modification P00096

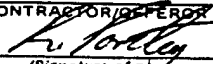
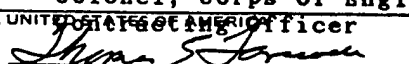
Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount
P00096-1	Concrete Core Drilling	1	JOB	SUM	\$27,250.00

The contract price is increased by the estimated amount of \$27,250.00. The contract completion date is unchanged by this modification.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and markups directly or indirectly related thereto, including impact.

If the foregoing modification is acceptable, it is requested that you sign in block 15B, complete blocks 15A and 15C and return the original to this office.

13-5-10

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J</b>				1. CONTRACT ID CODE		PAGE OF PAGES 1   2	
2. AMENDMENT/MODIFICATION NO. <b>P00098</b>		3. EFFECTIVE DATE <b>06JUN90</b>		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)	
6. ISSUED BY <b>S. Army Engineer Huntington, District rps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070</b>				7. ADMINISTERED BY (If other than Item 6) CODE			
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  <b>GLR Constructors Post Office Box "T" Point Pleasant, West Virginia 25550</b>				9A. AMENDMENT OF SOLICITATION NO.			
				9B. DATED (SEE ITEM 11)			
				10A. MODIFICATION OF CONTRACT/ORDER NO. <b>X      DACW69-88-C-0001</b>			
CODE		FACILITY CODE		10B. DATED (SEE ITEM 13) <b>87 Oct 23</b>			
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required) <b>MG GP GAL 05 50A0 0000 0320 284 (50%) FSN 96461 96X3122 CG CE; MG BB GAL 05 50A0 0000 0320 284 (50%)</b>							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: <b>X      Contract Clause 44, "Disputes" and Contract Clause 59 "Changes"</b>							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>one</u> copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)  Reference is made to Contract Clause 44 "Disputes" and Contract 59 "Changes" of the above numbered contract for construction of Locks in Canal, Gallipolis Locks and Dam, Ohio River, to GLR Constructors letter of May 16, 1988 submitting a claim for excess boulders and cobble encountered in drilling wells for the dewatering system, and to appeal docket number ENG BCA 5596.  Since an agreement has been reached for a full and complete settlement of the claim, it is necessary and in the best interest of the Government to modify the contract as follows: Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print) <b>Robert L. Portley Project Manager</b>				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) <b>THOMAS E. FAREWELL Colonel, Corps of Engineers</b>			
15B. CONTRACTOR/REFEROR  (Signature of person authorized to sign)		15C. DATE SIGNED <b>7-31-90</b>		16B. UNITED STATES OF AMERICA BY  (Signature of Contracting Officer)		16C. DATE SIGNED <b>18 June 90</b>	

PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-0-11

One new lump sum item for "Settlement of Claim for Dewatering Wells" shall be added to the contract as shown below. This item shall provide compensation for all costs arising from said claim and shall include all markups for both prime contractor and subcontractor, as well as any payment for interest which may be due.

<u>Item No.</u>	<u>Description</u>	<u>Quantity/Unit</u>	<u>Unit Price</u>
P00098-1	Settlement of Claim for Dewatering Wells	1 Job Sum	\$26,500.00

The contract price is increased by \$26,500.00. The contract time is unchanged.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractor for all costs and markups directly or indirectly related thereto, including impact, if any, on unchanged work and, for all interest which may be due. It is understood and agreed that upon acceptance of this modification and payment of said increase in contract price, the contractor hereby releases and forever discharges the Government from all causes of action, claims and demands which have been or could be made upon the basis of the facts giving rise to the aforementioned claim and appeal. Also, the contractor agrees to release, waive and forever abandon all claims to attorney's fees and other expenses arising from the appeal docketed as ENG BCA No. 5596 under the Equal Access to Justice Act (Pub L. No. 99-80, 99 stat. 183 [codified at 5 U.S.C. 504 and 28 U.S.C. 2412]).

If the foregoing modification is acceptable, it is requested that you sign in block 15B, complete blocks 15A and 15E and return the original to this office (ATTN: CEORH-CT).

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J				1. CONTRACT ID CODE		PAGE OF PAGE	
2. AMENDMENT/MODIFICATION NO. P00137		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)	
6. ISSUED BY U.S. Army Engineer District, Huntington Corps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070		CODE		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) GLR Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550				9A. AMENDMENT OF SOLICITATION NO.			
				9B. DATED (SEE ITEM 11)			
				10A. MODIFICATION OF CONTRACT/ORDER NO. DACW69-88-C-0001			
				10B. DATED (SEE ITEM 13) 87 OCT 23			
CODE		FACILITY CODE		11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS			
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended.							
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required) MP GP GAL 05 50A0 0000 0320 284 (50%)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
(V) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. X Contract Clause 59, "Changes"							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Refer to Contract Clause 59, "Changes" of the above referenced contract for Locks in Canal, Gallipolis Locks and Dam, Ohio River, West Virginia and Change "HB".  The referenced change directed the contractor to take particular steps, including forming and placing additional concrete, to mitigate the effects of rock overbreak in the monolith foundations excavations. The contractor has completed work under this modification and has submitted a proposal for adjustment to the contract price. Since it is anticipated that negotiations concerning the modification may not be finalized for several weeks, it has been determined to be in the best interest of the Government to make interim payment toward the final negotiated adjustment to the contract.							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
15B. CONTRACTOR/OFFEROR				16B. UNITED STATES OF AMERICA			
(Signature of person authorized to sign)				16C. DATE SIGNED			
				20 Dec 91			
15C. DATE SIGNED				16C. DATE SIGNED			
15D. DATE SIGNED				16D. DATE SIGNED			

PREVIOUS EDITION UNUSABLE

30-105-07

STANDARD FORM 30 (REV. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-0-13

As a result of the foregoing, one interim payment is hereby added to the contract as set forth below:

Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount
P00137-1	Interim Adjustment Due Contractor for Rock Overbreak	1	Job	Sum	\$300,000.00

The total contract price is increased by the estimated amount of \$300,000.00 as a result of this modification. There is no adjustment to the contract duration.

If the foregoing modification is acceptable, it is requested that you sign in block 15 B, complete blocks 15 A and 15 C of the form and return the original to this office along with the completed form for your Sureties (ATTN: CEORH-CT-C).

AMENDMENT OF SOLICITATION / MODIFICATION OF CONTRACT J		1. CONTRACT ID CODE	PAGE OF PAGES 1   3
2. AMENDMENT/MODIFICATION NO. P00153	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable) PJ
ISSUED BY S. Army Engineer District, Huntington Corps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070	CODE	7. ADMINISTERED BY (If other than Item 6)	CODE
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  GLR Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550		(d)	9A. AMENDMENT OF SOLICITATION NO.  9B. DATED (SEE ITEM 11)  10A. MODIFICATION OF CONTRACT/ORDER NO. DACW69-88-C-0001 10B. DATED (SEE ITEM 13) 87 Oct 23
CODE	FACILITY CODE		

# 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required) MG GP GAL 05 50A0 0000 0320 284 (50%)  
FSN 96461 96X3122 CG MG BB GAL 05 50100000 0320 284 (50%)

# 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

<input checked="" type="checkbox"/>	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
<input type="checkbox"/>	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
<input checked="" type="checkbox"/>	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Contract Clause 59, "Changes"
<input type="checkbox"/>	D. OTHER (Specify type of modification and authority)

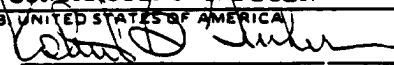

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Refer to the above numbered contract for: Locks in Canal, Gallipolis Locks and Dam, Ohio River, West Virginia and to Modification P00143 which directed the contractor to proceed with the construction of an unloading/loading dock to accommodate project floating plant. Since an equitable adjustment to the contract has been negotiated and agreed upon it will be necessary to incorporate the appropriate contract adjustments.

This modification is also referred to as Change "PJ."

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) Dennis E. Pullar, Vice President - Construction r SLN 92-367 dated August 27, 1992	15B. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) ROBERT B. TUCKER CONTRACTING OFFICER
15C. DATE SIGNED 8/27/92	15D. UNITED STATES OF AMERICA BY  (Signature of Contracting Officer)
15E. CONTRACTOR OFFICER  (Signature of person authorized to sign)	15F. DATE SIGNED 9/14/92

This modification will result in the addition of fourteen new payment items and the deletion of one interim payment item. The payment for these items will be made in accordance with the following price schedule:

Item No.	Description	Est. Quantity	Unit	Unit Price	Amount
P00153-1✓	Excavation for Crane Ramp	24,000	CY	\$3.01	\$72,240.00✓
P00153-2✓	Class I Subbase for Crane Ramp	586	CY	\$31.48	\$18,447.28✓
P00153-3✓	Number 57 Aggregate for Crane Ramp	604	CY	\$31.48	\$19,013.92✓
P00153-4✓	Stone Slope Protection due to Crane Ramp	1,018	CY	\$30.80	\$31,354.40✓
P00153-5	Structural Backfill for Crane Ramp	386	CY	\$3.64	\$1,405.04✓
P00153-6	Filter Cloth due to Crane Ramp	4518	SY	\$1.86	\$8,403.48✓
P00153-7	Steel Bars Concrete Reinforcing	20,358	LB	\$0.78	\$15,879.24✓
P00153-8	Steel Welded Wire Fabric Concrete Reinforcing W4X4 6X6	1,830	LB	\$1.36	\$2,488.80✓
P00153-9	Check Posts for Crane Ramp	2	EA	\$1,885.52	\$3,771.04✓
P00153-10	Gate Enlargement for Crane Ramp	1	JOB	SUM	\$565.36✓
P00153-11	Guardrail for Crane Ramp	639	LF	\$15.18	\$9,700.02✓
P00153-12	Ditch SSP (Top Size 10")	75	CY	\$45.17	\$3,387.75✓
P00153-13	Concrete for Crane Ramp	260	CY	\$376.39	\$97,861.40✓
P00153-14	Steel Sheet Piling Type PZ-22	1739	LF	\$39.98	\$69,525.22✓
P00143-4	Interim Payment for Unloading/Loading Ramp	-1	JOB	SUM	-\$200,000.00
Net Increase:					\$154,042.95

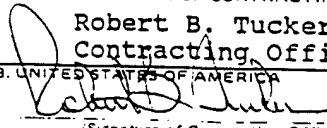
Page 3 of 3  
Contract No. DACW69-88-C-0001  
Modification P00153

The total contract price is increased by \$154,042.95 as a result of this modification. The total contract completion date remains unchanged by this modification.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and mark-ups directly and indirectly related thereto, including impact and interest.

If the foregoing modification is acceptable, it is requested that you have your sureties complete the consent of surety, sign the modification in block 15B, complete blocks 15A and C and return the entire original package to the U.S. Army Corps of Engineers, 502 8th Street, Huntington, WV 25701-2070, ATTN: CEORH-CT.

I am executing this modification as successor Contracting Officer.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J				1. CONTRACT ID CODE		PAGE OF PAGES 1   2	
2. AMENDMENT/MODIFICATION NO. P00177		3. EFFECTIVE DATE SEE BLOCK 16C		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable) TF	
6. ISSUED BY F ngton District C of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070		CODE		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  GLR Constructors Post Office Box "T" Point Pleasant, West Virginia 25550				9A. AMENDMENT OF SOLICITATION NO.			
				9B. DATED (SEE ITEM 11)			
				10A. MODIFICATION OF CONTRACT/ORDER NO. X DACW69-88-C-0001			
				10B. DATED (SEE ITEM 13) 87 Oct 23			
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required) <del>MG GP GAL 05 50A0 0000 0320 284 (50%)</del> FSN 96461 96X3122 CG CE: MG BB GAL 05 50A0 0000 0320 284 (50%)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
<input checked="" type="checkbox"/> THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT/ORDER NO. <del>109</del> 99, "Changes".							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input checked="" type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)  Reference is made to Contract Clause 59, "Changes" for the above numbered contract for Robert C. Byrd Locks and Dam, Ohio River, West Virginia.  This modification is issued unilaterally to provide an equitable adjustment for early removal of Buffer Zone.							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				Robert B. Tucker Contracting Officer			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
(Signature of person authorized to sign)				BY 		93 Dec 16	
				(Signature of Contracting Officer)			

s modification is also designated as Change "TF".

Since the Contractor refuses to recognize a credit for the early removal of the Buffer Zone, this modification is issued to insure the Government receives a reasonable credit.

This modification will result in the addition of one new item to the contract. The payment for this modification will be made in accordance with the following payment schedule:

<u>Item No.</u>	<u>Description</u>	<u>Qty</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
P00177	Credit for early removal of Buffer Zone	1	Job	Sum	(\$603,000.00)

Due to this modification, the total contract price as herein modified will be decreased by \$603,000.00.

The contract time will not be changed.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J				1. CONTRACT ID CODE	PAGE OF PAGES
2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)		
A00031	02 OCT 90		11 2		
6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than Item 6)		CODE	
U.S. Army Engineer District, Huntington Corps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070					
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				9A. AMENDMENT OF SOLICITATION NO.	
GLR Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550					
				9B. DATED (SEE ITEM 11)	
				10A. MODIFICATION OF CONTRACT/ORDER NO.	
				DACW69-38-C-0001	
				10B. DATED (SEE ITEM 13)	
				87 OCT 23	
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:  
(a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required) MG GP GAL 05 50A0 0000 0320 284 (50%)  
ESN 96461 96X3122 CG MG BB GAL 05 50A0 0000 0320 284 (50%)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

<input type="checkbox"/>	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
<input type="checkbox"/>	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
<input type="checkbox"/>	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
<input checked="" type="checkbox"/>	Contract Clause 59 - "Changes"
<input type="checkbox"/>	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)  
Refer to the above referenced contract for: Locks in Canal, Gallipolis Locks and Dam, Ohio River, West Virginia. Due to the nonutilization of three predrainage wells which were part of the minimum required dewatering system a credit is due the Government. Since the amount of the credit has been agreed upon, the contract is hereby modified to include the credit for the nonutilization of three predrainage wells.

This modification was formerly referred to as Change "DA."

The implementation of this credit will require the addition of one new pay item. The credit for this item will be taken in accordance with the following lump sum price schedule:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
ROBERT L. PORTLEY, PROJECT MANAGER		Ronald C. Harris Administrative Contracting Officer	
15B. CONTRACTOR/OFFICER	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
<i>[Signature]</i> (Signature of person authorized to sign)	10-4-90	BY <i>[Signature]</i> (Signature of Contracting Officer)	10-2-90

PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-C-20

Page 2 of 2  
Contract No. DACW69-88-C-0001  
Modification A00031

Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount
A00031-1	Credit for Pre- drainage Wells	1	JOB	SUM	\$800.00

The total contract price is decreased by \$800.00 as a result of this modification. The total contract completion date is unchanged by this modification.

This adjustment constitutes compensation in full on the behalf of the contractor and its subcontractors and suppliers for all costs and markups directly and indirectly related thereto, including impact.

If the foregoing modification is acceptable, it is requested that you sign in block 15B, complete blocks 15A and 15C and return the original to this office.

RECEIVED  
MAY 3 1988  
313

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT J				1. CONTRACT ID CODE	PAGE OF PAGES 1   2
2. AMENDMENT/MODIFICATION NO. <b>A00059</b>	3. EFFECTIVE DATE <b>2 JUL 91</b>	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable) <b>JG</b>		
ISSUED BY <b>Army Engineer District, Huntington Corps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070</b>		7. ADMINISTERED BY (If other than Item 6) <i>of Santa Dal</i>		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  <b>GLR Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550</b>				9A. AMENDMENT OF SOLICITATION NO.	
				9B. DATED (SEE ITEM 11)	
				10A. MODIFICATION OF CONTRACT/ORDER NO. <b>X DACW69-88-C-0001</b>	
				10B. DATED (SEE ITEM 13) <b>87 OCT 23</b>	
CODE		FACILITY CODE			
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required) <b>MG GP GAL 05 50A0 0000 0320 284 (50%) FSN 96461 96X3122 CG MG B3 GAL 05 50A0 0000 0320 284 (50%)</b>					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.					
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).					
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: <b>X Contract Clause 59 - "Changes" and Contract Clause 64 - "Value Engineering - Construction"</b>					
D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)  Refer to the above numbered contract for: Locks in Canal, Gallipolis Locks and Dam, Ohio River West Virginia. Since the Contractor's Value Engineering Proposal for the deletion of piezomet. in structural backfill has been determined to be acceptable and an adjustment to the contract has been negotiated, it is necessary to modify the contract accordingly. Therefore, the piezomet. in the structural backfill required by specification paragraph 2L; 7.6 are hereby deleted from the contract.  This modification was formerly referred to as Change "JG."  This modification will result in the addition of two new items. The payment for these items shall be made in accordance with the following lump sum price schedule: Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15A. NAME AND TITLE OF SIGNER (Type or print)  <b>OBERT L. PORTLEY, PROJECT MANAGER</b>			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)  <b>RONALD C. HARRIS ADMINISTRATIVE CONTRACTING OFFICER</b>		
CONTRACTOR OFFICER <i>[Signature]</i> (Signature of person authorized to sign)			15C. DATE SIGNED <b>6-20-91</b>		
			16B. UNITED STATES OF AMERICA BY <i>[Signature]</i> (Signature of Contracting Officer)		
			16C. DATE SIGNED <b>7-2-91</b>		

PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-0-22

Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount
A00059-1	VE-Deletion of Piezometers in Structural Backfill	1	JOB	SUM	-\$16,050.00
A00059-2	VECP Incentive Adjustment to Contractor	1	JOB	SUM	\$8,827.50
Net Decrease to Contract Amount					-\$7,222.50

The total contract price is decreased by \$7,222.50 as a result of this modification. The total contract completion date remains unchanged by this modification.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and markups directly and indirectly related thereto, including impact.

If the foregoing modification is acceptable, it is requested that you sign in block 15B, complete blocks 15A and 15C and return the original to this office.

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE J		PAGE OF PAGE 1   2	
2. AMENDMENT/MODIFICATION NO. A00081	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable) NO
6. ISSUED BY U.S. Army Engineering District, Huntington orps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070		7. ADMINISTERED BY (If other than Item 6) CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) GLR Constructors P.O. Box "T" Pt. Pleasant, West Virginia 25550		9A. AMENDMENT OF SOLICITATION NO.	
		9B. DATED (SEE ITEM 11)	
		10A. MODIFICATION OF CONTRACT/ORDER NO DACW69-88-C-0001	
		10B. DATED (SEE ITEM 13) 87 OCT 23	
CODE	FACILITY CODE		

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required) MG GP GAL 05 50AO 0000 0320 284 (50%)  
FSN 96461 96X3122 CG MG BB GAL 05 50AO 0320 284 (50%)

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X Contract Clause 59, "Changes"

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

## 14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible)

Refer to the above numbered contract for: Locks in Canai, Gallipolis Locks and Dam, Ohio River, West Virginia. Also, refer to Request for Clarification Number 567. Since it is necessary to fill auxiliary chamber weep holes with pea gravel, the additional work specified in RFC 567 is hereby incorporated into the contract. Therefore, an adjustment to the contract is required to compensate the additional work.

This modification is also referred to as Change "NO".

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) ROBERT L. PORTLEY, PROJECT MANAGER CONSISTENT WITH GLR SEE LTR #79-222 DATED June 1992 CONTRACTOR OFFEROR		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) DES R. GOYAL Administrative Contracting Officer	
15C. DATE SIGNED June 1992		16C. DATE 17 June 92	
(Signature of person authorized to sign)		(Signature of Contracting Officer)	

PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV)  
Prescribed by GSA  
FAR (48 CFR) 53.243

13-0-24

Page 2 of 2  
Contract No. DACW69-88-C-0001  
Modification A00081

Item No.	Description	Estimated Quantity	Unit	Unit Price	Amount
A00081-1	Fill Weep Holes with Pea Gravel	1	JOB	SUM	\$17,958.70

The total contract price is increased by \$17,958.70 as a result of this modification. The total contract completion date remains unchanged by this modification.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and markups directly and indirectly related thereto, including impact.

If the foregoing modification is acceptable, it is requested that you sign in block 15B, complete blocks 15A and 15C and return the original to this office.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT<sup>J</sup>

1. CONTRACT ID CODE

PAGE 1 OF 2

2. AMENDMENT/MODIFICATION NO.

200144

3. EFFECTIVE DATE

4. REQUISITION/PURCHASE REQ. NO.

5. PROJECT NO. (If applicable)

RY

ISSUED BY

CODE

7. ADMINISTERED BY (If other than Item 6)

CODE

U.S. Army Engineer District, Huntington  
Corps of Engineers  
502 Eighth Street  
Huntington, West Virginia 25701-2070

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

GLR Constructors  
P.O. Box "T"  
Pt. Pleasant, West Virginia 25550

(Y) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

10A. MODIFICATION OF CONTRACT/ORDER NO.

X

DACW69-88-C-0001

10B. DATED (SEE ITEM 13)

87 OCT 23

CODE

FACILITY CODE

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:  
(a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

## 12. ACCOUNTING AND APPROPRIATION DATA (If required)

3N 96461 96X3122 CG MG BB GAL 05 50A0 0000 0320 284 (50%)

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.



A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying off appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X Contract Clause 59, "Changes"

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

## 14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Refer to the above numbered contract for: Locks in Canal, Gallipolis Locks and Dam, Ohio River, West Virginia. During a preliminary inspection it was discovered that the lock crossovers had excessive water leaks. It was determined necessary to stop the leaks by injecting a polyurethane grout into the voids. Therefore; the grouting of the lock crossovers is hereby incorporated into the contract price.

This modification is also referred to as Change "RY."

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

George E. Mason, Project Manager

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Des R. Goyal

Administrative Contracting Officer

15B. CONTRACTOR/OFFEROR

PER LTR 93-205 DATED 7-16-93

George E. Mason

(Signature of person authorized to sign)

15C. DATE SIGNED

7-16-93

16B. UNITED STATES OF AMERICA

BY Des R. Goyal

(Signature of Contracting Officer)

16C. DATE SIGNED

16 July 93

PREVIOUS EDITION UNUSABLE

30-105-02

STANDARD FORM 30 (REV. 10)  
Prescribed by GSA

13-G-26

This modification will result in the addition of one new item. Payment for this item will be made in accordance with the following lump sum price schedule:

Item No.	Description	Est. Quantity	Unit	Unit Price	Amount
A00144-1	Grout Lock Crossovers	1	Job	LS	\$55,000.00

The total contract price is increased by \$55,000.00 as a result of this modification. The total contract completion date remains unchanged by this modification.

This adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and markups directly and indirectly related thereto, including impact.

the foregoing modification is acceptable, it is requested that you sign in block 15B, complete blocks 15A and 15C and return the original to this office.

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

2. AMENDMENT/MODIFICATION NO. P00174		3. EFFECTIVE DATE See Block 16 c	4. REQUISITION/PURCHASE REQ. NO.	1. CONTRACT ID CODE	PAGE OF PAGE 1 2
SUEB BY Huntington District Corps of Engineers 502 Eighth Street Huntington, West Virginia 25701-2070		CODE	7. ADMINISTERED BY (If other than Item 6)	5. PROJECT NO. (If applicable)	CODE

8. NAME AND ADDRESS OF CONTRACTOR (No. street, county, State and ZIP code)  GLR Constructors Post Office Box "T" Point Pleasant, West Virginia 25550		(X)	9A. AMENDMENT OF SOLICITATION NO.
			9B. DATED (SEE ITEM 11)
			10A. MODIFICATION OF CONTRACT/ORDER NO. DACW69-88-C-0001
		X	10B. DATED (SEE ITEM 13) 87 Oct 23
CODE	FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA ((If required)) MG GP GAL 05 50A0 0000 C320 284 (50%)  
FSN 96461 96X3122 CG CE: MG BB GAL 05 50A0 0000 C320 284 (50%)

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
X	Contract Clause 59, "Changes".
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO AUTHORITY OF:
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

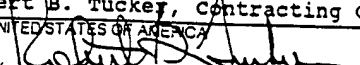
E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Reference is made to Contract Clause 59, "Changes" for the above numbered contract for Robert C. Byrd Locks and Dam, Ohio River, West Virginia and Modification P00137.

This modification is issued unilaterally to provide an equitable adjustment for changes outlined in this herein. Modification P00137 was issued for interim payment.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) CONTRACTOR/OFFEROR		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Robert B. Tucker, Contracting Officer	
(Signature of person authorized to sign)		15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY  (Signature of Contracting Officer)
		16C. DATE SIGNED 9 Aug 16	

Page 2 of 2  
Contract No. DACW69-88-C-0001  
Modification P00174

This change was referred to as Change "NN" for Modification P00137 and "HB" for Modification P00174.

The following work is included in this change:

- a. Additional rock excavation in areas of overbreak.
- b. Additional structural backfill in overbreak areas.
- c. Placement of concrete outside of neatline as required.
- d. Formwork in overbreak areas as required.

Since the contractor has declared negotiations at an impasse, this modification is issued to provide an equitable adjustment for the changed work.

This modification will result in the addition of 2 new items to the contract. The payment for this modification will be made in accordance with the following payment schedule:

<u>ITEM</u> <u>NO.</u>	<u>DESCRIPTION</u>	<u>QTY</u>	<u>UNIT</u>	<u>UNIT</u> <u>PRICE</u>	<u>AMOUNT</u>
P00174-1	Deletion of Interim P'mnt	1	Job	Sum	(\$300,000.00)
P00174-2	Adjustment due Contractor	1	Job	Sum	\$286,693.06

Due to this modification, the total contract price as herein modified will be decreased by \$13,306.94

The contract time will not be changed.

It is considered that this adjustment constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and markup directly or indirectly attributable to the change order, including impacts, delays and interest, and for performance of the change within the time frame stated.

# G.L.R. CONSTRUCTORS

Address Reply To:

P.O. Box 1267  
Minneapolis, MN 55440

Re: Gallipolis Locks Replacement  
Contract #DACW69-88-C-0001

Serial Letter No. 21

November 10, 1987

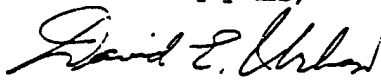
Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P. O. Box 9  
Apple Grove, WV 25502-0009

Dear Sir:

Please define the limits of the five foot thick compacted impervious layer which is to be placed over the slurry cutoff wall. This impervious layer is only shown on the typical section of the slurry cutoff wall on drawing O-L26B-16/121.

Is this impervious layer required over the total length of the slurry wall? If so, what is the required elevation at the relocated access road and at the granular fill and structural backfill for the new access road? What is the required width of the impervious layer?

Very truly yours,



David E. Urban  
Project Manager

DEU:JNZ:sjs

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT. DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-021

February 5, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Extension of Slurry Cut-off Wall

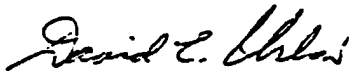
Gentlemen:

GLR Constructors intends to utilize a slurry cutoff wall to expedite the excavation of material between the contract design slurry wall and the temporary Flatfoot Creek Extension.

Attached are six (6) copies of GLR Constructors drawing EX-3 which gives the location of the wall. The top of the wall will be at an approximate elevation 560 and will extend to rock.

If there are any questions please contact this office.

Sincerely,



David E. Urban  
Project Manager

DEU:JNZ:lp

Enclosures

An Equal Opportunity Employer

13-R-2

# **G L R CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW89-88-C-C**  
Post Office Box T  
Point Pleasant, WV  
(304) 675-7050

Serial Letter No. 88-0030

February 10, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P O Box 9  
Apple Grove, WV 25502-0009

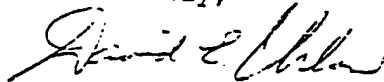
Attention: Mr. Ronald C. Harris

Subject: Hazard Analysis Plan for the Operations of Drilling  
and Pipe Laying to be done by Griffin Dewatering

Gentlemen:

Enclosed you will find the Hazard Analysis Plan for drilling  
and pipe laying to be done by Griffin Dewatering.

Sincerely,



David E. Urban  
Project Engineer

DEU:JK:als

Enclosures



JOB HAZARD ANALYSIS

<u>PHASE</u>	<u>HAZARD</u>	<u>PRECAUTIONARY ACTION</u>
Drilling	A. Fire	A1 Fire extinguishers on each piece of equipment.
	B. Backing Danger	B1 All equipment to be equipped with a working back-up alarm and, if needed, a signalman.
	C. Fueling	C1 Equipment will be shut down. C2 Fuel trucks to be provided with fire extinguishers.
	D. Riders on Equipment	D1 No riders on equipment when it is in motion, except operator.
	E. Equipment Maintenance	E1 All equipment will be shut down. E2 Preventive maintenance will be done as scheduled.
	F. General	F1 Operators and swamper will mount and dismount properly.



JOB HAZARD ANALYSIS

<u>PHASE</u>	<u>HAZARD</u>	<u>PRECAUTIONARY ACTION</u>
Pipe Laying	A. Unloading of Equipment	A1 No person shall be on the unloading side of carrier after stakes have been removed.
	B. Stacking of Pipe	B1 Shall not be stacked higher than 5 feet.  B2 Shall be stacked & blocked so as to prevent spreading.  B3 A pyramided stack or batt stack will be used.
	C. Assembly of Pipe	C1 Shall be done by slings & spreaders.  C2 Will be hoisted by cherry picker.
	D. General	D1 Personnel will use safe & prudent judgement in handling material.

# G-L-E CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-049

February 25, 1988

Resident Engineers  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Differing Site Conditions - Well Drilling

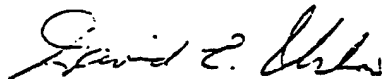
Gentlemen:

The enclosed letter from our dewatering subcontractor (Griffin) provides notification of a differing site condition as a result of encountering boulders during well drilling operations.

We request that the Contracting Officer take appropriate action pursuant to Article 46 of the Contract Clauses as soon as possible.

Thank you for your attention to this matter.

Sincerely,



David E. Urban  
Project Manager

DEU:mm

Enclosure

An Equal Opportunity Employer

13-A-6

February 24, 1988



GLR Constructors  
P.O. Box 1  
Point Pleasant, WV 25550

Attention: David Urban

Subject: Changes (1984 APR) FAR 52.243-4

Dear Mr. Urban:

In submitting our bid for dewatering we referred to the specifications reference (3.1 thru 3.2.4). The impression given was that the alluvium is "clay" underlain by "sand" and "sand and gravel."

Further, we were to anticipate "some gravel, cobbles, and an occasional boulder." The specifications go on to say (and is underlined-3.2.2) that due to the split-spoon sampling method employed "gravel and cobbles" may exist. We note this paragraph omits any reference to boulders.

Subsequently, in the drilling of wells #1 thru #4 we have in general encountered not only extensive layers -2' to 6' thick- of large cobbles, but boulders as well at the 40' depth and again at 55' at each well location.

We now suspect this condition may continue throughout our phase of the work. This goes far beyond what we believe was what the owner anticipated and reflected in his specification.

To displace or remove these extensive deposits of cobbles and boulders has more than doubled our drilling time.

We believe the owner's intent was to anticipate only an occasional problem of this nature. Therefore, we are herewith submitting our request for a changed condition.

Please issue a change order to cover this extra time and cost.

Very Truly yours,

  
Vince Cummings  
Project Supervisor

VC:vh

RECEIVED

FEB 24 1988

GLR

# **G L F CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-059

March 7, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

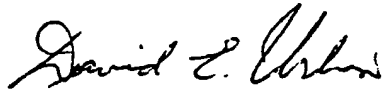
Attention: Mr. Ronald C. Harris

Subject: Addendum to Griffin Dewatering  
Hazard Analysis

Gentlemen:

As per your instruction the following hazard controls are now  
included in the hazard analysis for drilling and pipe laying.

Sincerely,



David E. Urban  
Project Manager

DEU:JJK:mm

Enclosures

An Equal Opportunity Employer

13-A-8

From: Griffin Dewatering

March 3, 1988

The following is to be included in our hazard analysis:

Drilling. When moving the drill from one area to another, all tools and equipment shall be secure and the mast placed in a horizontal position. Particular care shall be taken when operating near power lines. All employees shall wear seat belts. Drill holes large enough to be a hazard shall be covered or guarded. When applying calcium hypochlorite, employee shall wear respirators. Men shall not be on a mast while the drill bit is in operation. Gloves shall be worn by operators, and caution shall be exercised around the augers in motion.

Pipe Laying. In removing 4" iron pipe from wells, remove one joint at a time. Do not lift long length of pipe into the air. No one shall be under a picked load. Cherry picker must be load tested, and have load chart posted in the operators cab. Must have one person designated as signal man. Employees shall avoid inhalation of fumes from pipe cement.

  
Vince Cummings  
General Superintendent

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-000  
Post Office Box T  
Point Pleasant, WV 2555  
(304) 675-7050

Serial Letter No. 88-066

March 11, 1988

CI #20

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Additional Piezometers

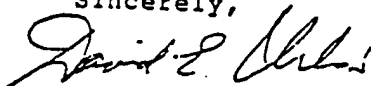
Gentlemen:

Reference is made to Article 9.1(2), Specification Section 20 Control of Groundwater and Surface Water. Article 9.1(2) states that the groundwater table on each side of the slurry cutoff wall is to be measured by means of piezometers installed at the locations shown on the drawings.

The contract drawing showing the locations of piezometers (see 0-L26B-16/121) does not show any piezometers on the outside of the slurry cutoff wall. Our subcontractor, Griffin Dewatering Inc., on their groundwater control plan (transmittal No. 2002) have proposed four (4) additional piezometers located on the outside of the slurry cutoff wall.

Should the Government wish to add the proposed piezometers, please be advised that GLR Constructors considers this a change to the Contract and shall expect an equitable adjustment to the Contract for any and all costs incurred due to this change. We request that we be furnished the Government's decision on the additional piezometers within ten (10) days from receipt of this letter.

Sincerely,



David E. Urban  
Project Manager

DEU:JDV:mm

An Equal Opportunity Employer

13-R-10

# G-L-R CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-068

March 14, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

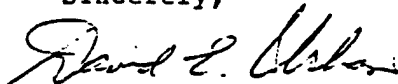
Subject: Predrainage Well Location at Evapotranspiration Mound  
VECP #6, T.P. 2D

Gentlemen:

Reference is made to the location of the predrainage wells in the vicinity of the evapotranspiration mound.

Our subcontractor is scheduled to install these wells on March 16, 1988. It is necessary that we have a decision made on our VECP No. 6 prior to this date in order that we can drill these wells in the appropriate location. Unless otherwise directed by the Corps of Engineers, the wells will be drilled at the locations shown on the drawings.

Sincerely,



David E. Urban  
Project Manager

DEU:JNZ:lp

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-082

March 25, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Slurry Wall Location Conflict  
Change Item No. 3

Gentlemen:

Receipt is acknowledged of the Government Serial Letter Number 95, dated March 7, 1988. GLR Constructors does not agree with the Government's position on the subject issue.

The Contract clearly defines and shows the slurry cutoff walls extending from the natural ground elevation to the top of rock as previously stated in our Serial Letter No. 88-024. The impervious cap as shown in the Contract does not form an integral part of the slurry cutoff but is placed on top of the slurry wall to form a protective covering. The impervious cap as stated in the Government's response to question 35 of the Pre-Bid Conference is to be paid for under the bid item for "Compacted Impervious Materials" and is not incidental to the slurry wall construction.

GLR Constructors shall expect to be paid for the slurry trench cutoff wall as stated in Paragraphs 4.(5), 9.2 and 12 of Section 2E. The top of trench as shown on the contract drawings and as defined is the original ground elevation.

An Equal Opportunity Employer

13-R-12

# GLR CONSTRUCTORS

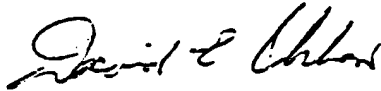
GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

GLR Constructors will proceed with construction of the slurry wall at the location shown on drawing No. 0-L26B-16/53 to the elevations defined in Section 2E, Paragraphs 4.(5), 9.2 and 12. Any additional work, costs and/or delays caused by the apparent conflict shall be considered as a change to the Contract.

Sincerely,



David E. Urban  
Project Manager

DEU:JDV:mm

# G-L-R CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT • DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-090

April 1, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P O Box 9  
Apple Grove, W V 25502-0009

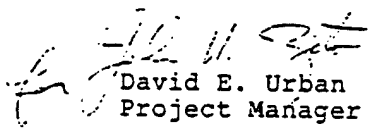
Attention: Mr. Ronald C. Harris

Subject: Hazard Analysis - Slurry Wall  
TP-SC

Gentlemen:

Enclosed is a revision of the original hazard analysis  
for the slurry wall which includes your recommendations.

Sincerely,

  
David E. Urban  
Project Manager

DEU:JJK:als

Enclosure

An Equal Opportunity Employer

13-R-14



124 South Van Brunt Street, P.O. Box 749  
Englewood, New Jersey 07631

Tel: (201) 568-4311  
Telex: 139332 ICOS USA  
FAX: (201) 568-9794

Gallipolis Locks and Dam  
Ohio River  
Hogsett, West Virginia  
Job # 36  
Project # DACW 69-87-B-0033

### Preparatory Excavation Operation Hazard Analysis Plan

ICOS Corporation of America in setting up its hazard analysis plan will follow the U S Army Corps of Engineers Safety and Health Requirement Manual, EM385-1-1. Revised October 1984.

#### HAZARD

During the excavation of the slurry trench with the backhoe, the following hazards are presented. The trench excavation with bentonite slurry may have the possibility for personnel or machines to go into it.

#### HAZARD CONTROL

ICOS will mark and flag open areas of excavation. Also, the hazards will be discussed at safety meetings. To cross the excavation ICOS will use a bridge or personnel will cross behind the backhoe where no excavation has begun. The bridge crossing the trench will have handrails. All heavy equipment will be kept clear of the open trench edge. When working near the lock wall esplanade or access road, special care will be exercised to insure the safety of the public and river traffic. A signal man will be used when necessary.

#### HAZARD

The backhoe excavating poses two hazards to equipment and personnel.

- a) Swing of machine
- b) Moving backward

#### HAZARD

During the excavation of the slurry trench, cleaning of the excavation, removal of rock, and supplying Agitor backfill mixer with premixed backfill with the crawler cranes, the following hazards are presented.

- a) Swing of machine
- b) Moving backward
- c) Clamshell buckets

#### HAZARD CONTROL

ICCS, even though it is not required by the Operating Engineers Union Agreement, will have an oiler whose job will be to insure clearances for safe excavation, in relation to personnel and property is maintained and normal maintenance to the machine. ICOS will have a backup alarm. The alarm will work in either direction of travel automatically.

ICOS will instruct all personnel not to park any vehicles or equipment behind the backhoe during excavation periods.

#### HAZARD CONTROL

The soil specialist in the field or his/her assistants will set up the cranes in position and observe operation of, to insure personnel and property are protected from injury or damage from the swing of the machine or from the excavating buckets.

Personnel will not work or pass under clamshell buckets, picked loads, etc. The crane for backward movement will either turn so the operator has full view of where he/she is going or the soil specialist or his/her assistant will guide the crane back.

HAZARD

Agitor Backfill Mixer

- a) Various pinch points
- b) Elevated shell

HAZARD

Bulldozer premixing backfill and cleanup.

- a) Movement in the field near cranes.

HAZARD

Backfilled slurry trench

- a) Personnel may walk into it
- b) Equipment may be driven into it.

HAZARD CONTROL

Before the personnel operate the Agitor mixer, they will be instructed as to its use and will read the operating manual.

Safety Decals.

(See attachment A)

HAZARD CONTROL

Operator will be instructed to watch cranes swing and stay clear where excavating buckets are in operation. Backup alarms will be used.

HAZARD CONTROL

Backfilled slurry trench will be flagged to alert all of its location and presence, until capped. Capping on the completed portion of trench will be done in 500 + LF sections.

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT **DACW69-88-C-0001**  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 68-148

May 16, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

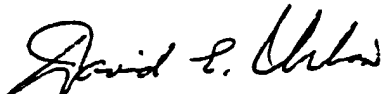
Subject: Well Drilling  
Differing Site Conditions  
Change Item No. 9

Gentlemen:

Pursuant to Contract Clause 44, GLR Constructors hereby submits four (4) copies of our claim for the subject change for your review and approval.

Pursuant to Contract Clause 71, GLR Constructors hereby certifies that this claim is made in good faith, that the supporting data is accurate and complete to the best of the Contractor's knowledge and belief; and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes that the Government is liable.

Sincerely,



David E. Urban  
Project Manager

DEU:JDV:mm

Enclosures

An Equal Opportunity Employer

13-R-18

# **GALLIPOLIS LOCKS REPLACEMENT**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

*Verbally instructed  
to continue  
@ 5:00 PM*

Serial Letter No. 88-155

May 20, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Specification Variance  
Slurry Wall Construction

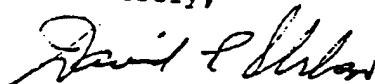
Gentlemen:

Reference is made to Specification section 2E, paragraph 7.2.

A variance from the ten (10) percent maximum sand content of the bentonite slurry is requested. Enclosed for your review and approval is our subcontractors proposal to minimize the percent deviation of the sand content and still maintain the density of the slurry to the specified amount.

We request your prompt review and approval of our proposal.

Sincerely,



David E. Urban  
Project Manager

DEU:JDV

Enclosure

An Equal Opportunity Employer

# **GLR CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-195

June 22, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

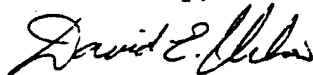
Attention: Mr. Ronald C. Harris

Subject: Extension of Slurry Cutoff Wall

Gentlemen:

Enclosed, as requested in Corps of Engineers Serial Letter No. 54, are GLR Constructors engineering consultant's report and the construction method to be used on the extension of the slurry wall. The procedures for dewatering will follow in a subsequent letter.

Sincerely,



David E. Urban  
Project Manager

DEU:AVM:la

An Equal Opportunity Employer

13-R-20

# **G L R CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-348

November 9, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

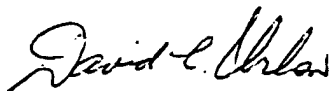
Attention: Mr. Ronald C. Harris

Subject: Hazard Analysis

Gentlemen:

Attached is the Hazard Analysis for exploratory drilling operations.

Sincerely,



David E. Urban  
Project Manager

DEU:JJK:mm

An Equal Opportunity Employer

13-R-21

HAZARD ANALYSIS FOR EXPLORATORY DRILLING

PHASE

HAZARD

PRECAUTIONARY ACTION

Exploratory  
Drilling

a. General

- 1) Employees will wear the proper personal protective equipment required by the job rules. ie. safety glasses, hard hats, steel toe boots.

- 2) Proper drilling procedures will be followed. Men shall not be on the mast while the drill-bit is in operation.

b. Moving of  
equipment

- 1) The drill rigs will have the proper safety equipment on them. ie. fire extinguishers, back-up alarms, seat belts.
- 2) When moving the rig from one area to another, all tools and equipment shall be secure and the mast placed in a horizontal position.

- 3) While backing up a signalman will be used if needed.

- 4) There will be no riders on the equipment except where there are seat with seat belts provided. Seat belts will be used.

c. Fueling

- 1) The drill rig will be shut down.

d. Equipment  
Maintenance

- 1) During equipment inspections the rig will be shut down.

- 2) Preventive maintenance will be done as scheduled.

=====

PHASE	HAZARD	PRECAUTIONARY ACTION
-------	--------	----------------------

=====

- |                |   |
|----------------|---|
| e. Drill holes | 1) Drill holes large enough to be a hazard shall be covered or guarded.                               |
| f. Noise       | 1) Hearing protection will be used if needed.   |
| g. Augers      | 1) Gloves shall be worn by the operators, and caution shall be exercised around the augers in motion. |

Drill  
Hole Grouting

- |                |   |
|----------------|---|
| h. Cement dust | 1) respirators will be worn by the person mixing the cement |
|                | 2) Gloves will be worn by anyone handling the grout.        |

# **G L R CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-351

November 11, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

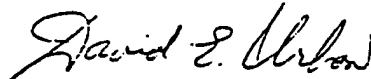
Subject: Exploratory Drilling Order of Work  
Specification 2I-5

Gentlemen:

As previously mentioned in our recent meetings, GLR Constructors would like to request a variance in the above referenced specification which requires that a minimum distance of 400 feet be maintained between exploratory drilling and rock excavation. This request for variance applies only to four holes at the outlet structure and its surrounding area.

A detailed plan depicting each phase of work regarding this variance, is enclosed for your review.

Sincerely,



David E. Urban  
Project Manager

DEU:TO:1a

Enclosures

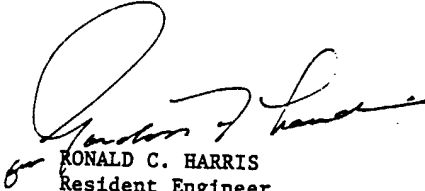
An Equal Opportunity Employer

## DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
CEORH-CD-GAL	Exploratory Drilling Construction of the New Gallipolis Locks Contract No. DACW69-88-C-0001
XM THRU: CEORH-CD TO: CEORH-ED ATTN: Steve Hornbeck	FROM CEORH-CD-GAL
DATE 15 November 1988 CMT 1 MORGAN/cs/576-9901	

1. Forwarded for your review and guidance is the contractor's serial letter number 88-351. The contractor is requesting a variance in specification 2I-5 which requires a minimum distance of 400 feet be maintained between exploratory drilling and rock excavation. This variance only applies to specific holes in the outlet structure.
2. It is requested that you provide your response as soon as possible. This variance would allow the contractor to proceed with rock excavation for the river wall prior to removing the existing overburden at the outlet structure.

  
RONALD C. HARRIS  
Resident Engineer

Encl

DA FORM 2496  
AUG 80

PREVIOUS EDITIONS WILL BE USED

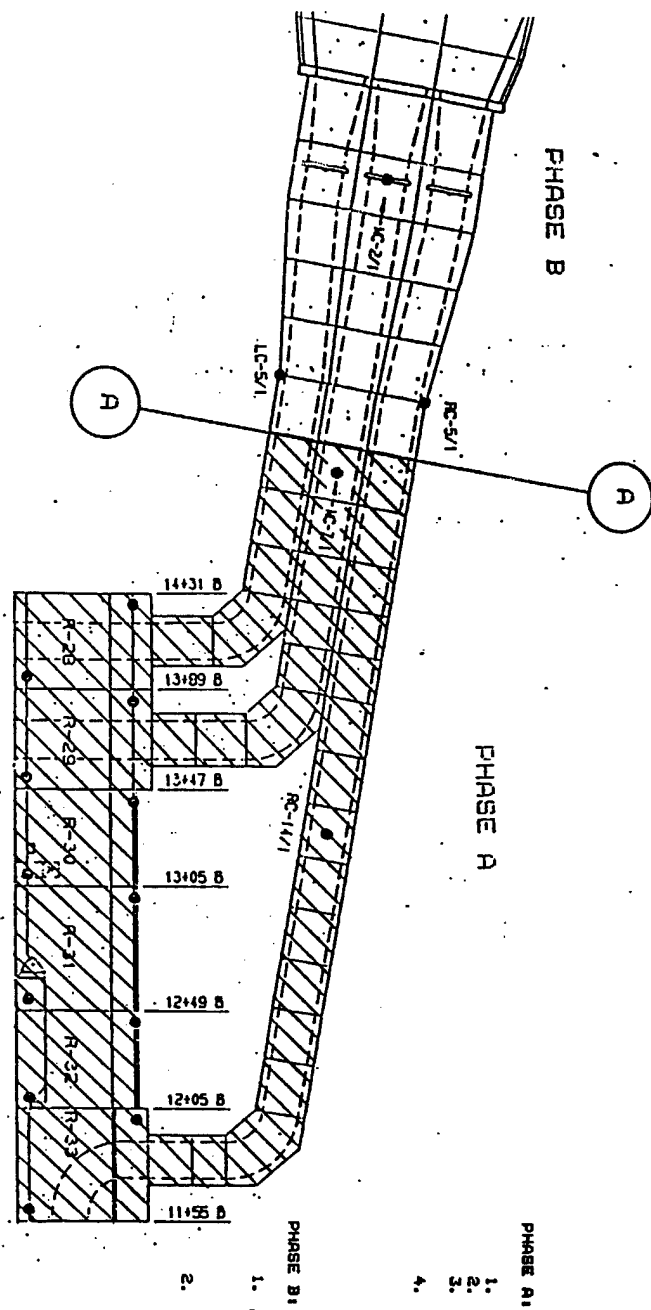
☆ GPO : 1987 O - 172-423

13-R-25



— ROCK EXCAVATION IN PHASE A

OUTLET STRUCTURE AND SURROUNDING RIVER WALL MONOLITHS



# G L R CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 88-398

December 16, 1988

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

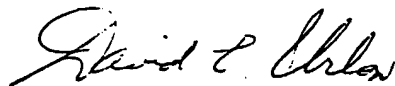
Attention: Mr. Ronald C. Harris

Subject: Hazard Analysis

Gentlemen:

Attached is the Hazard Analysis for the rock drilling and blasting operations.

Sincerely,



David E. Urban  
Project Manager

DEU:JJK:mm

Enclosures

An Equal Opportunity Employer

13-R-27

13-4-28

PROJECT: GLR CONSTRUCTORS  
PREPARED BY: JEFF KERR  
DATE: 12-15-88

JOB HAZARD ANALYSIS FOR BLASTING

OPERATION

HAZARDS

HAZARD CONTROLS

General

a. General

1) Permission in writing shall be initially obtained from the COE before explosives or blasting agents are brought on the job. Periodic replenishment of approved supplies does not require written approval.

2) All loading and firing shall be directed and supervised by one designated person.

3) No explosives or blasting agents shall be abandoned.

Maintenance  
and testing

a. Equipment  
malfunction

1) If used electric blasting machines shall be maintained and used only as prescribed by the manufacturer. Blasting machines shall be tested prior to use and periodically thereafter as prescribed by the manufacturer.

2) Blasting machines shall be secured and accessible only to the blaster. Only the blaster shall connect the leading wire to the machine.

OPERATION

HAZARDS

HAZARD CONTROLS

Transportation  
and storage of  
explosives

a. Improper  
transportation

- 1) Vehicles used for the transportation of explosives shall not be loaded beyond rated capacity and the explosives shall be secured to prevent shifting of load or dislodgement from the vehicle. When explosives are transported by a vehicle with an open body, a class II magazine or original manufacturers' container shall be securely mounted on the bed to contain the cargo.
- 2) All vehicles transporting explosives shall be marked with reflectorized placards on both sides, the front and rear, and the word EXPLOSIVES in red letters not less than 4 inches high on a white background.
- 3) All vehicles for transportation of explosives shall be in charge of and operated by a person who is physically fit, careful, reliable, able to read and understand instructions, and not under the influence of intoxicants or narcotics.
- 4) A vehicle containing explosives shall not be taken into a garage or repair shop, parked in congested areas, or stored at any time.
- 5) All vehicles shall be inspected by the head mechanic before transporting any explosives and all electric wiring completely protected and securely fastened to prevent short circuits. A written record of such inspection shall be kept on file.

-----  
OPERATION  
-----

HAZARDS  
-----

HAZARD CONTROLS  
-----

- 6) Vehicles transporting explosives shall be operated with extreme care.
- 7) Only the authorized driver and his helper shall be permitted to ride on any conveyance transporting explosives or detonators.
- 8) No vehicle shall be refueled while explosives are on the motor vehicle except in an emergency.
- 9) Vehicles transporting explosives shall not be left unattended.
- 1) No spark-producing tools, carbides, oils, matches, firearms, electric storage batteries, flammable substances, acids or oxidizing or corrosive compounds shall be carried in the body of any vehicle transporting explosives.
- 2) Vehicles used in the transportation of explosives shall be in good repair.
- 3) Vehicles transporting explosives shall be equipped with one or more fire extinguishers having a rating of 10-B:C placed at strategic points. The driver will be trained in the use of the extinguisher.

b. Sparks

12-8-21

-----  
OPERATION  
-----

HAZARDS  
-----

HAZARD CONTROLS  
-----

4) Persons employed in the transportation, handling, or other use of explosives shall not smoke or carry on their persons or in the vehicle, matches, firearms, ammunition, or flame-producing devices.

c. Improper  
handling

1) Containers of explosives shall be opened only with nonsparking tools or instruments.

2) Explosives shall be removed from containers only as they are needed for immediate use.

3) Explosives and detonators or primers shall be taken to the blasting area in separate nonmetallic containers.

4) Primers shall not be made up in excess of immediate need for holes to be loaded.

5) Primers shall not be made up in or near magazine or excessive quantities of explosives.

6) After loading of a blast is completed, all excess explosives and detonators shall be removed to a safe location or returned at once to the storage magazines, observing the same rules as when being conveyed to the blasting area.

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OPERATION  
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HAZARDS  
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HAZARD CONTROLS  
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7) A bulk truck will contain approximately 10,000 lbs. of explosives and act as a magazine for its contents.

d. Improper storage

- 1) Explosives and related materials shall be stored in facilities required under the Alcohol, Tobacco, and Firearms (ATF) regulations contained in 27 CFR 181, Commerce in Explosives.
- 2) Magazines shall be bullet-resistant, rodent-resistant, weather-resistant, ventilated, and meet the standards of ATF or Institute of Makers of Explosives.
- 3) The minimum distance between magazines storing detonators and magazines storing explosives shall be 100 feet, unbarricaded or 50 feet barricaded. Detonators, primers, or other initiators, shall not be stored in the same magazine with explosives or blasting agents.
- 4) The area around the magazine for a distance of 25 feet (7.62 m) shall be kept clear of vegetation and all combustible matter.
- 5) Provisions shall be made for safe transfer of explosives to magazine vessels including substantial ramps or walkways free of tripping hazards.

OPERATION

HAZARDS

HAZARD CONTROLS

- 6) All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use record of all explosives. Authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.
- 7) Magazines in which explosives are stored shall not be used for any other purpose.
- 8) No spark-producing agent of any description shall be kept in magazines.
- 9) Explosives shall be arranged in the magazine so that the oldest stock is used first.
- 10) Repairs to magazine shall not be made without first removing all explosives to a safe distance and providing them with protection.
- 11) Explosives shall be stored only in original containers.
- 12) Containers of explosives shall be stored with top side up, so that the cartridges are lying flat and not standing on end.

OPERATION

HAZARDS

HAZARD CONTROLS

13) Magazines shall be kept dry and clean and the area posted with "EXPLOSIVES" signs unless the use of these signs is prohibited by local authority. The signs shall be located so that a bullet passing through the sign will not strike the magazine.

14) Explosives containers shall be opened, packed, or repacked only at a distance of at least 50 feet (15.24 m) from any magazine.

15) Smoking, matches, firearms, open flames, or any flame-producing device shall not be permitted within 100 feet (30.48m) of any magazine.

16) Magazine floors that become stained with nitroglycerin shall be scrubbed with a non-sparking broom or brush using a freshly made solution composed of one-half gallon (133.6 ml) of water, one-half gallon wood alcohol, and 2 pounds (907.2 g) of sulfide of sodium. Plenty of liquid should be used so as to thoroughly decompose the nitroglycerin. Fire and explosion precautions must be taken.

Drilling

a. Improper drilling procedures

1) All drill holes shall be of greater diameter than the cartridges of explosives used.

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OPERATION  
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HAZARDS  
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HAZARD CONTROLS  
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- 2) Drilling shall not be done in any area already blasted until remaining "bootlegs" (holes that don't detonate full depth) are examined for unexploded charges and the total area has been examined to make sure that there are not unexploded charges remaining. Never insert a drill, pick, or bar into bootlegs even if examination fails to disclose explosives. No drilling shall be performed within 50 feet (15.24 m) of a loaded hole that has failed to detonate.
- 3) Drilling and loading operations shall not be carried on in the same area. Drilling shall be separated from loaded holes by at least the depth of the loaded hole but in no case less than 50 feet.
- 4) Dust from all drilling shall be controlled by dust collectors or other means, such as dust masks.
- 5) Men shall not be on a mast while the drill-bit is in operation unless they are provided with a safe platform from which to work and they are required to use safety belts to avoid falling.
- 6) Drill crews and others shall stay clear of augers or drill stems that are in motion. Persons shall not pass under or step over a moving stem or auger.

OPERATION

HAZARDS

HAZARD CONTROLS

7) When a drill is being moved from one drilling area to another, drill steel, tools, and other equipment shall be secured and the mast placed in a safe position. This does not apply when the drill is being moved to the next hole within the drilling area.

8) In the event of power failure, drill controls shall be placed in the neutral position until power is restored.

9) The drill stem shall be resting on the bottom of the hole or on the platform with the stem secured to the mast before attempts are made to straighten a crossed cable on a reel.

10) While in operation, drills shall be attended at all times.

11) Drill holes large enough to constitute a hazard shall be covered or guarded.

12) Men shall not hold the drill steel while collaring holes, or rest their hands on the chuck or centralizer while drilling.

Loading

a. Improper loading

1) The loading or loaded area shall be kept free of any equipment operations, or persons not essential to loading.

2) Tamping shall be done with a wooden stick or approved loading tool.

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OPERATION  
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HAZARDS  
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HAZARD CONTROLS  
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- 3) Primers shall not be tamped.
- 4) Cartridges shall be seated by even steady pressure only.
- 5) All loaded holes or charges shall be checked and located before firing.
- 6) Cartridges shall be primed only in the number required for a single round of blasting.
- 7) Caps shall be inserted into dynamite only in holes made for the purpose. Holes shall be punched with a nonmetallic punch.
- 8) Detonating cord shall be cut from supply reel before loading the remainder of the charge.
- 9) Loaded holes shall be stemmed to the collar with non-combustible material.
- 10) No explosives, blasting agents, or loaded holes, shall be left unattended at the blast site.
- 11) No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives and detonators shall be immediately returned to an authorized magazine.

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OPERATION  
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HAZARDS  
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HAZARD CONTROLS  
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- 12) Detonating cord shall be handled and used with care to avoid damaging or severing the cord during and after loading and hooking-up.
- 13) Detonating cord connections shall be positive in accordance with recommended methods. Knot or other cord-to-cord connections shall be made only with detonating cord in which the explosive core is dry.
- 14) All detonating cord trunklines shall be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation.
- 15) All detonating cord connections shall be inspected before firing the blast.
- 16) When detonating cord millisecond-delay connectors or short-interval-delay electric blasting caps are used with detonating cord, the practice shall conform to the manufacturer's recommendations.
- 17) When connecting a blasting cap to detonating cord, the cap shall be taped or otherwise attached securely along the side or the end of the detonating cord, with the charged ends pointing in the direction that the detonating cord will detonate.

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 OPERATION  
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HAZARDS  
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HAZARD CONTROLS  
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Firing of  
 explosives

a. Improper  
 firing  
 procedures

18) Detonators for firing the trunkline shall not be brought to the loading area nor attached to the detonating cord until everything else is in ready for the blast.

- 1) Prior to the firing of a shot, all persons in the danger area shall be warned of the blast and ordered to a safe distance.
- 2) Blast shall not be fired until it is certain that every person has retreated to a safe distance and no one remains in a dangerous location.
- 3) All blasting operations shall use the following signals:

WARNING SIGNAL---A one-minute series of long blasts 5 minutes prior to blast signal.

BLAST SIGNAL---A series of short blasts 1 minute prior to the shot.

ALL CLEAR SIGNAL---A prolonged blast following the inspection of blast area. boat whistle on a drill boat shall not be used as a blasting signal.

- 4) The code of blasting signals and marking signs and flags shall be posted at all access points.

OPERATION

HAZARDS

HAZARD CONTROLS

- 5) Prior to each shot, a competent flagperson shall be posted at all access points to danger areas.
- 6) No blast shall be fired closer than 250 feet (76.2 m) to a boat or vessel containing an explosive magazine.
- 7) The person making leading line connections shall fire the shot. All connections shall be made from the bore hole back to the source of firing and the leading line shall remain detached and not be connected to the blasting machine or other source of ignition until the charge is to be fired.
- 8) After firing a blast, the leading lines shall be immediately disconnected from the firing power source.

c. Thunderstorms

- 1) Operations involving the handling or use of explosives shall be discontinued and personnel moved to a safe area during approach or progress of a thunderstorm or severe dust storm. Controls will be established to prevent accidental discharge of electric blasting caps from extraneous electricity, if electric blasting caps are used.

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 OPERATION  
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HAZARDS  
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HAZARD CONTROLS  
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2) A lightning detector to detect and measure the probability of lightning or massive static electrical discharges shall be used.

d. Unauthorized personnel in blasting area

1) Warning signs shall be provided at points of access to blasting area.

e. Concussion and fly-rock

1) Sufficient firing line shall be provided to permit the blaster to be located at a safe distance from the blast.

f. House keeping

1) All refuse from explosive loading such as empty boxes, paper, and fiber packing shall not be used again for any purpose, but shall be destroyed by burning at an approved location.

g. Equipment

1) Mechanized equipment (including drills) shall not be operated within 50 feet of a loaded hole.

h. Vibration and damage control

1) Prior to initiation of vibration controlled blasting operations, a written plan for monitoring the operations shall be established.

OPERATION

HAZARDS

HAZARD CONTROLS

2) Where vibration damage may occur, the peak particle velocity recorded by a three component seismograph at structures or facilities shall not exceed 2-inches per second for structures not associated with work, and 4-inches per seconds for structures associated with work. When any recording indicates this criteria has been exceeded, blasting shall be suspended and the COE shall be notified immediately. Blasting shall not be resumed until the probably cause has been determined and corrective measures taken.

3) When a blast is planned that would have a scaled distance less than 50 ft., a 3 component seismograph shall be used to monitor vibration levels. The maximum weight of the explosives will be estimated by the following equation:

$$\text{Log } W = 1.25 \text{ Log } V - 2.7551 + 2 \text{ Log } R$$

Where: V = peak particle velocity in inches per second  
R = Shortest distance between the blast and point of interest  
W = Maximum weight of explosives per delay period of 8 milliseconds or more

OPERATION

HAZARDS

HAZARD CONTROLS

4) The scaled distance shall be determined in advance of each shot and included in the records.

5) The monitoring, recording, and interpreting of vibrations shall be by qualified personnel.

6) Records and interpretations shall be furnished to the COE.

Inspection  
after firing

a. General

1) Immediately after blast has been fired, the firing line shall be disconnected from the blasting machine or power source. Power switches shall be locked open.

2) An inspection shall be made by the blaster to determine that all charges have been exploded. All lines shall be traced and search made for unexploded cartridges.

3) Other persons shall not be allowed to return to the area of the blast until an "All Clear" signal is given.

4) Loose pieces of rock and other debris shall be scaled down from the sides of the face of excavation and the area made safe before proceeding with the work.

OPERATION

HAZARDS

HAZARD CONTROLS

b. Misfires

- 1) Misfires shall be handled under the direction of the person in charge of blasting. If a misfire is found, the blaster shall provide proper safeguards for excluding all employees, except those necessary to do the work, from the danger zone.
- 2) No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.
- 3) If broken lines, or faulty connections, are determined as the cause of a misfire, the repairs shall be made, the firing line reconnected and tested, and the charge fixed. This shall be done, however, only after an inspection has been made of burdens remaining in such holes and no hole shall be so refired when the burden has been dangerously weakened by other shots.
- 4) No attempt shall be made to extract explosives from any charged or misfired hole. A new primer shall be put in and the hole reblasted. If refiring of the misfired hole represents a hazard, the explosives may be removed by washing out with water or, where the misfire is under water, blown out with air.

OPERATION

HAZARDS

HAZARD CONTROLS

5) Misfired charges tamped with solid material shall be detonated by the following method where practical:

Float out the stemming by the use of water, place a new primer and detonate.

6) No drilling, digging, or picking shall be permitted until all missed holes have been detonated or the blaster has approved that work can proceed.

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 89-170

April 24, 1989

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Payment for Sill Excavation  
Change Item No. 103

Gentlemen:

Reference is made to Progress Pay Estimate No. 35 dated March 25, 1989, Progress Pay Estimate No. 36 dated April 10, 1989, Specification Section 2F-6, Paragraph 7.3.2 - Sill Excavation and the statements made by our Mr. John Zito at a March 17, 1989 meeting.

GLR Constructors takes exception to the Government's position that sill excavation (Bid Item 14) is to only be paid below approximate elevation 495.0. The specialized blasting operation associated with sill excavation substantially differs than that for general rock excavation. The blasting operation for sill excavation begins at the top of rock elevation (approximate elevation 497.0) and therefore, payment should be made under Bid Item 14 for all excavation of rock at the sill locations.

In accordance with Contract Clause 44 - Disputes, the Government is hereby notified of the aforementioned demand for payment. As of April 10, 1989, payment in the amount of \$5,040.00 for Sill Excavation remains outstanding. We will continue to submit Progress Pay Estimates for all rock excavation at the sill locations under the Bid Item 14 unit price. Additionally, this letter will serve as notification of a change to the contract in accordance with Contract Clause 59.

An Equal Opportunity Employer

13-R-46

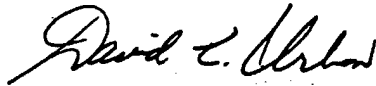
# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

GLR Constructors hereby certifies that this claim is made in good faith, that the supporting data is accurate and complete to the best of the Contractor's knowledge and belief; and that the amount accurately reflects the Contract adjustment for which the Contractor believes that the Government is liable.

Sincerely,



David E. Urban  
Project Manager

DEU:BMP:mm

An Equal Opportunity Employer

# **GLR CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 89-241

June 24, 1989

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Preliminary Cleanup  
Change Item 101

Gentlemen:

Reference is made to GLR Constructors' Serial Letter No. 89-191, dated May 9, 1989, regarding preliminary cleanup of rock surfaces. The above referenced letter was written before any substantial amount of cleanup was completed.

Notwithstanding the Government's determinations that preliminary cleanup is unnecessary, a review of field operations and the contract shows that GLR Constructors is in fact, and of necessity, performing preliminary cleanup.

In support of the above, consideration should be given to the following:

- A) The obvious intent of preliminary cleanup is the removal of debris from the area above the top of the rock surface so that a determination can be made concerning further excavation. It is also necessary so that areas of loose and drummy rock can be identified. Removal of loose and drummy rock is part of the final cleanup operation.
- B) Final cleanup and foundation preparation, Paragraph 15.3 of section 2F, is the removal of loose and/or weathered rock etc. from the in place rock surface. It necessarily follows that any removals which are above the in place rock surface are not part of final cleanup.

An Equal Opportunity Employer

# **GLR CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT** **CONTRACT DACW69-88-C-0001**

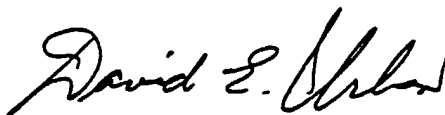
- C) The bid quantity for preliminary cleanup is 78,000 sq. yd, whereas the bid quantity for final cleanup is 71,000 sq. yd. It is very obvious that the Government intended that all areas which required final cleanup would also require preliminary cleanup. GLR Constructors relied on this representation when submitting our bid proposal.

Our position on this matter was recently illustrated at monolith R-37. By Serial Letter No. 717, the Corps of Engineers directed that no preliminary cleanup was necessary. During the supposedly final cleanup, we were directed to perform further excavation.

In summary, it is our position that preliminary cleanup has been performed at all areas where final cleanup has been performed. These pay quantities will be requested for the pay period ending June 25, 1989 and in subsequent estimates as the work is performed.

Please contact us if you have any questions, comments or opposite opinions.

Sincerely,



David E. Urban  
Project Manager

DEU:la

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV-25550  
(304) 675-7050

Serial Letter No. 90-048

March 5, 1990

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

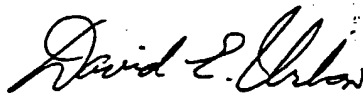
Attention: Mr. Ronald C. Harris

Subject: Payment for Dental Treatment  
Change Item No. 127

Gentlemen:

Reference is made to the Government's Serial Letter No. 1102, dated February 13, 1990. GLR Constructors hereby takes exception to the Government's position as stated in their above referenced letter pertaining to Contract Bid Item No. 18 - "Dental Treatment". Pursuant to Contract Clause 44 - "Dispute", a Contracting Officer's decision is hereby requested within 60 days.

Sincerely,



David E. Urban  
Project Manager

DEU:BMP:la

An Equal Opportunity Employer

# **G L R CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW89-88-C-0001**  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 90-270

October 4, 1990

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Pre-Drainage Well System  
Modification A00031  
Change Item No. 53

Gentlemen:

Enclosed is the executed original Modification A00031 for the above subject change which was forwarded under Government Serial Letter No. 1382, dated October 2, 1990.

Sincerely,



Robert L. Portley  
Project Manager

RLP:LKA:kh

Enclosure

An Equal Opportunity Employer

# **GLR CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

October 30, 1990

Serial Letter No. 90-290

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Contract Progress Payment No. 72  
Payment Ending: October 27, 1990

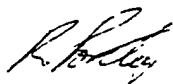
Gentlemen:

Transmitted herewith is our documentation for Contract Progress Payment of Bid Item work performed through October 27, 1990.

The total amount due the Contractor is \$3,395,745.92.

The quantities in Bid Item 10 "Slurry Trench Cut-off Walls", Bid Item 269 "Portland Cement", Bid Item 270 "Pozzolan", and Bid Item 18 "Dental Treatment" have been revised to match the Government's quantities. In addition, all mass concrete quantities reflect "neat line" measurements. GLR Constructors reserves the right to pursue payment for any and all additional costs resulting from the excessive amount of incompetent rock encountered to date. These quantity reductions have been made solely to expedite the processing of this and future progress payments. In no way do these revisions signify acknowledgment of agreement with the Government's quantities completed to date.

Sincerely,



Robert L. Portley  
Project Manager

RLP:MLG:kh

Enclosures

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# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

November 13, 1990

Serial Letter No. 90-302

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Contract Progress Payment No. 73  
Payment Ending: November 10, 1990

Gentlemen:

Transmitted herewith is our documentation for Contract Progress Payment of Bid Item work performed through November 10, 1990.

The total amount due the Contractor is \$2,724,175.80.

The quantities in Bid Item 10 "Slurry Trench Cut-off Walls", Bid Item 269 "Portland Cement", Bid Item 270 "Pozzolan", and Bid Item 18 "Dental Treatment" have been revised to match the Government's quantities. In addition, all mass concrete quantities reflect "neat line" measurements. GLR Constructors reserves the right to pursue payment for any and all additional costs resulting from the excessive amount of incompetent rock encountered to date. These quantity reductions have been made solely to expedite the processing of this and future progress payments. In no way do these revisions signify acknowledgment of agreement with the Government's quantities completed to date.

Sincerely,



Robert L. Portley  
Project Manager

RLP:MLG:kh

Enclosures

An Equal Opportunity Employer

13-A-53

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

November 27, 1990

Serial Letter No. 90-305

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Contract Progress Payment No. 74  
Payment Ending: November 24, 1990

Gentlemen:

Transmitted herewith is our documentation for Contract Progress Payment of Bid Item work performed through November 24, 1990.

The total amount due the Contractor is \$1,898,627.55.

The quantities in Bid Item 10 "Slurry Trench Cut-off Walls", Bid Item 269 "Portland Cement", Bid Item 270 "Pozzolan", and Bid Item 18 "Dental Treatment" have been revised to match the Government's quantities. In addition, all mass concrete quantities reflect "neat line" measurements. GLR Constructors reserves the right to pursue payment for any and all additional costs resulting from the excessive amount of incompetent rock encountered to date. These quantity reductions have been made solely to expedite the processing of this and future progress payments. In no way do these revisions signify acknowledgment of agreement with the Government's quantities completed to date.

Sincerely,



Robert L. Portley  
Project Manager

RLP:MLG:kh

Enclosures

An Equal Opportunity Employer

April 9, 1990



Griffin Dewatering Corporation  
3450 Calumet Avenue  
P.O. Box 604  
Hammond, IN 46320  
219-931-1662  
312-374-5255 Chicago

GLR CONSTRUCTORS  
P. O. Box T  
Pt. Pleasant, WV 25550

G. L. R.

APR 10 1990

RECEIVED

Attn: Jim Valentine

Re: Lower Approach Wall Dewatering  
Plan  
Gallipolis Lock & Dam Replacement

Gentlemen;

This letter will describe our dewatering plan for the above referenced project.

SCOPE

We plan on installing a series of deepwells from elevation 525'± to the top of rock (497'±).

We will use the jetting method for installation. The wells will be 12" in diameter, made of metal, with a sanitary cap installed for protection against high river elevation.

The pumps will be 440 volt, 3 phase, 15 horse power, with a bottom suction. They will have a four inch (4") discharge.

The wells on the river side will have their own separate discharge lines to the river. Wells on the land side will have a common discharge line (12" aluminum pipe) that will transport the groundwater to the river.

The starter boxes for the pumps will be placed on 4" X 4" poles near the cellular cofferdam. This will insure against damage when the river elevations rise. The starter boxes will be rainproof. Electric cable will run between each starter box and pump. The cable will be a #10/4.

Sincerely,

  
Bill Abromitis  
Sales Engineer

BA/ps  
Encl.

TRANS 523 B  
Dm 2

Transmittal No. 523B -Item 5  
Response to Questions

- 1) Encroachment of layout on the required D/S plug has been minimized by the deletion of cell 8 from this phase of the work. The encroachment on the D/S plug required for cell 7 is indicated on the layout drawing.
- 2) Open standpipe piezometers have been added per the Government's recommendation.
- 3) The general concept for the construction of cells 8 thru 19 was discussed at August 1, 1990 meeting. The detailed scheme for these cells will be submitted at a later date.
- 4) A well has been added at the downstream end of the dike.
- 5) Dikes shall be constructed of compacted impervious in accordance with Specification Section 2L.
- 6) Acknowledged.

TRANSMITTAL NO. 5238  
CONTRACT NO. DACW69-88-C-C001

COMMENT SHEET

The contractor's plan for the construction of cells 1 through 7 is approved subject to the following:

- a. Satisfactory performance must be achieved.
- b. It is assumed that the contractor has fulfilled his responsibility of coordinating the construction of cells 8 through 19 with this plan and that no problems exist. The contractor should proceed to submit his plan for the construction of cells 8 through 19 as soon as possible.
- c. This work shall be performed in the October-November time frame as proposed by the contractor. While the months of October and November are historically low flow months, there is also a high potential for catastrophic flood events to occur in this time frame. It is assumed that the contractor has properly analyzed this risk and prepared his plan with the appropriate precautions. However, the government shall not be liable for any damages to work on the downstream cells due to a flood event.
- d. It is also assumed that the contractor has fully evaluated the effects of the encroachment on the downstream plug. Therefore, the contractor is assuming the additional risk of failure in the event of a catastrophic flood event and the government shall not be held liable should any damage occur due to the encroachment on the downstream plug.
- e. The contractor is reminded that the safety of the workplace is his responsibility and as such he should be prepared to stop work on the downstream cells should failure of this dewatering and dike system appear imminent.

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

January 7, 1990

Serial Letter No. 91-002

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Contract Progress Payment No. 76  
Payment Ending: December 29, 1990

Gentlemen:

Transmitted herewith is our documentation for Contract Progress Payment of Bid Item work performed through December 29, 1990.

The total amount due the Contractor is \$1,508,511.38.

The quantities in Bid Item 10 "Slurry Trench Cut-off Walls", Bid Item 269 "Portland Cement", Bid Item 270 "Pozzolan", and Bid Item 18 "Dental Treatment" have been revised to match the Government's quantities. In addition, all mass concrete quantities reflect "neat line" measurements. GLR Constructors reserves the right to pursue payment for any and all additional costs resulting from the excessive amount of incompetent rock encountered to date. These quantity reductions have been made solely to expedite the processing of this and future progress payments. In no way do these revisions signify acknowledgment of agreement with the Government's quantities completed to date.

Sincerely,



Robert L. Portley  
Project Manager

RLP:MLG:kh

Enclosures

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-020

January 30, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: October 1990 NAS Update  
Special Clause 18

Gentlemen:

Reference is made to the Government's Serial Letter No 1508 dated January 18, 1991, and to GLR Constructors Serial Letter No. 91-003 dated January 9, 1991. Pursuant to the Government's request, the following explanation is offered as to the incorporation of logic revisions to the October 1990 NAS Update.

The logic revisions for the activity for sill construction was revised for several reasons:

- 1) The activity for sill erection previously encompassed the construction of all miter gate sills, emergency gate sills, and maintenance bulkhead sills and provided virtually no parallel to related construction activities i.e. gate erection.
- 2) The downstream sills were completed in May of 1990. The upstream sills have yet to begin and therefore a substantial lapse in the overall activity duration results in a false indication of actual construction duration.
- 3) The emergency gate sills have little correlation to the construction of the upstream miter gate and maintenance bulkhead sills. Because the network is limited in the number of schedule activities, only new activities were developed for the construction of the emergency gate sills since these sills involve the greatest amount of work. The upstream miter gate erection durations were extended to encompass the construction of the associated sills thereby avoiding additional activities. No schedule activities exist in reference to the maintenance bulkheads due to the restriction of schedule activities.

An Equal Opportunity Employer

# G L R CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

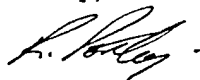
The revisions to the miter gate erection logic were implemented solely to represent the most current planned erection sequence. The current erection sequence is to erect the miter gates in the main lock downstream, then the main lock upstream, then the auxiliary lock downstream and finally the auxiliary lock upstream.

Corrections to the October 1990 Report of Progress, which will be shown in the November Update, include:

- 1) The scope of work under ANO 21201 "Cells D/S Guidewall - Drive Sheets #1 to #8" was incorrectly changed to sheets #1 to #6, and shall be corrected to read "Cells D/S Guidewall - Drive Sheets #1 to #7".
- 2) The scope of work under ANO 21202 "Cells D/S Guidewall - Drive Sheets #9 to #14" was incorrectly changed to sheets #7 to #14, and shall be corrected to read "Cells D/S Guidewall - Drive Sheets #8 to #16".
- 3) The scope of work under ANO 21204 "Cells D/S Guidewall - Tremie Concrete #1 to #8" was incorrectly changed to cells #1 to #6, and shall be corrected to read "Cells D/S Guidewall - Tremie Concrete #1 to #7".
- 4) The scope of work under ANO 21205 "Cells D/S Guidewall - Tremie Concrete #9 to #14" was incorrectly changed to cells #7 to #14, and shall be corrected to read "Cells D/S Guidewall - Tremie Concrete #8 to #16".

Additional title revisions are consequently necessary for ANO 21203 and ANO 21206 which will also be reflected in the November 1990 NAS Update.

Sincerely,



Robert L. Portley  
Project Manager

RLP:EMP:1a

An Equal Opportunity Employer

# **G L R CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW89-88-C-0001**

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-026

February 12, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

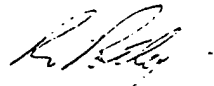
Subject: Subcontractors Certificate of Insurance

Gentlemen:

Enclosed is an updated Certificate of Insurance for our Subcontractor, Griffin Dewatering Corporation.

If you have any questions about this certificate, please contact Gary Olerud in our office.

Sincerely,



Robert L. Portley  
Project Manager

RLP:GA0:ls

enclosure

An Equal Opportunity Employer

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-280

August 14, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Des Goyal

Subject: Drilling of Weep Holes  
Change Item No. 272 (VECP)

Gentlemen:

Per Contract Specification Section 2V, weep holes are to be drilled with rotary type equipment but no core recovery is required. Additionally, the weep holes are to be thoroughly cleaned by flushing with water and compressed air and kept clean and plugged until the Contracting Officer directs the removal of the plugs.

GLR Constructors contends that, since the weep holes require cleaning after drilling, percussion in lieu of rotary type equipment can be utilized. Also, during operation of the locks, the weep holes will eventually become filled with silt, etc.

Therefore, we are pleased to submit our Value Engineering Change Proposal for the substitution of percussion in lieu of rotary type equipment for drilling of weep holes.

Our firm priced proposal is included as "Attachment I" which reflects a savings of \$9,853.00 to the Contract price.

We request that this proposal receive your favorable attention and acceptance as soon as possible since the weep hole drilling operation is scheduled to begin during early September 1991.

An Equal Opportunity Employer

# **G L R CONSTRUCTORS**

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GALLIPOLIS LOCKS REPLACEMENT CONTRACT DACW69-88-C-0001

G L R Constructors is available to meet with the Contracting Officer's representative to discuss this proposal.

Sincerely,



Robert L. Portley  
Project Manager

RLP:ALK:ls

Enclosure

# **G L R CONSTRUCTORS**

**GALLIPOLIS LOCKS REPLACEMENT**

**CONTRACT DACW69-88-C-0001**  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

## **ATTACHMENT I**

Bid Item No. 174 - Drilling Weep Holes (Rotary) 7550 LF @ 4.00/LF = \$30,200.00

New - Drilling Weep Holes (Percussion) 7550 LF @ 1.10/LF = \$ 8,305.00

Gross Savings - \$21,895.00

Contractor's Share - \$12,042.00

Government's Share - \$ 9,853.00

An Equal Opportunity Employer

# G L R CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-282

August 20, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Des Goyal

Subject: Contract Pricing Proposal Cover Sheet -  
Standard Form 1411


Gentlemen:

Per recent discussions between our respective staff members, Standard Form 1411 is required for proposals for \$100,000 or more; not \$500,000 as previously understood.

Therefore, enclosed herewith are the required forms for the following proposals:

<u>DESCRIPTION</u>	<u>CI NO.</u>	<u>MCD NO.</u>
Rock Overbreak Areas	117	---
Access Road Base Modifications	176	P00104
Additional Testing of Sector Gears	198	A00043
Testing of Six Additional Pintle Castings	201	A00039

Sincerely,

  
Robert L. Portley  
Project Manager

RLP:ALK:ls

Enclosure

An Equal Opportunity Employer

CONTRACT PRICING PROPOSAL COVER SHEET		1. SOLICITATION/CONTRACT/MODIFICATION NO. DACW-69-88-C-0001		FORM APPROVED OMB NO. 3090-0118
NOTE: This form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6(b))				
2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)		3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT N/A		3B. TELEPHONE NO. 304-675-7050
4. TYPE OF CONTRACT ACTION (Check)				
<input type="checkbox"/> A. NEW CONTRACT		<input type="checkbox"/> D. LETTER CONTRACT		
<input checked="" type="checkbox"/> B. CHANGE ORDER		<input type="checkbox"/> E. UNPRICED ORDER		
<input type="checkbox"/> C. PRICE REVISION/REDETERMINATION		<input type="checkbox"/> F. OTHER (Specify)		
5. TYPE OF CONTRACT (Check)		6. PROPOSED COST (A+B+C)		
<input checked="" type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF <input type="checkbox"/> FPI <input type="checkbox"/> OTHER (Specify)		A. COST    B. PROFIT/FEE    C. TOTAL \$ 103,866.73    \$ 12,192.27    \$ 116,059.00		
7. PLACE(S) AND PERIOD(S) OF PERFORMANCE				
Gallipolis Locks Replacement Contract DACW-69-88-C-0001 (1987 - 1992)				
8. List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this record is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)				
A. LINE ITEM NO.	B. IDENTIFICATION	C. QUANTITY	D. TOTAL PRICE	E. REF.
	See GLR Constructors; proposal transmitted via Serial Letter No. 91-254, dated August 5, 1991.  Re: Modification No. A00043 Change Item No. 198			
9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)				
A. CONTRACT ADMINISTRATION OFFICE		B. AUDIT OFFICE		
N/A		N/A		
10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? (If "Yes," identify)		11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete item 11B)		11B. TYPE OF FINANCING (If one)
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> ADVANCE PAYMENTS <input checked="" type="checkbox"/> PROGRESS PAYMENTS <input type="checkbox"/> GUARANTEED LOANS
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))		13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)		
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)				
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)		B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 or 2)? (If "Yes," specify in proposal the office to which submitted and if determined to be adequate)		
<input type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> YES <input type="checkbox"/> NO		
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)		D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)		
<input type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> YES <input type="checkbox"/> NO		
This proposal is submitted in response to the RFP contract, modification, etc. in item 1 and reflects our best estimates and/or actual costs as of this date				
15. NAME AND TITLE OF OFFEROR		16. NAME OF FIRM		18. DATE OF SUBMISSION
Robert L. Portley, Project Manager		GLR Constructors		8/19/91
17. SIGNATURE				

NSN 7540-01-142-7845

1411 101

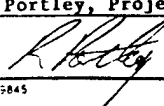
U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 381-526 (9016)

STANDARD FORM 1411 (10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.215-2(c)

<b>CONTRACT PRICING PROPOSAL COVER SHEET</b>		1. SOLICITATION/CONTRACT/MODIFICATION NO. <b>DACW-69-88-C-0001</b>		FORM APPROVED OMB NO. <b>3090-0118</b>	
NOTE: This form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6(b))					
2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)		3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT <b>N/A</b>		3B. TELEPHONE NO. <b>304-675-7050</b>	
4. TYPE OF CONTRACT ACTION (Check)					
<input type="checkbox"/> A. NEW CONTRACT		<input type="checkbox"/> D. LETTER CONTRACT			
<input checked="" type="checkbox"/> B. CHANGE ORDER		<input type="checkbox"/> E. UNPRICED ORDER			
<input type="checkbox"/> C. PRICE REVISION/REDETERMINATION		<input type="checkbox"/> F. OTHER (Specify)			
5. TYPE OF CONTRACT (Check)		6. PROPOSED COST (A+B+C)			
<input checked="" type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF		A. COST <b>\$ 148,923.28</b>			
<input type="checkbox"/> FPI <input type="checkbox"/> OTHER (Specify)		B. PROFIT/FEE <b>\$ 17,481.17</b>			
		C. TOTAL <b>\$ 166,404.45</b>			
7. PLACE(S) AND PERIOD(S) OF PERFORMANCE					

### Gallipolis Locks Replacement Contract DACW-69-88-C-0001 (1987 - 1992)

8. List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)				
A. LINE ITEM NO.	B. IDENTIFICATION	C. QUANTITY	D. TOTAL PRICE	E. REF.
	See GLR Constructors' proposal transmitted via Serial Letter No. 91-246, dated July 25, 1991.  Re: Modification A00039 Change Item No. 201			

9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)	
A. CONTRACT ADMINISTRATION OFFICE  <b>N/A</b>	B. AUDIT OFFICE  <b>N/A</b>
10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? (If "Yes," identify)	11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete item 11B)
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))	11B. TYPE OF FINANCING (If one)
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<input type="checkbox"/> ADVANCE PAYMENTS <input checked="" type="checkbox"/> PROGRESS PAYMENTS
	<input type="checkbox"/> GUARANTEED LOANS
13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)	
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)	
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)	B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1) or DS-1? (If "Yes," specify in proposal the office to which submitted and if determined to be adequate)
<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> YES <input type="checkbox"/> NO
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)	D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)
<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> YES <input type="checkbox"/> NO
This proposal is submitted in response to the RFP, contract, modification, etc. in item 1 and reflects our best estimates and/or actual costs as of this date	
15. NAME AND TITLE (Type)	16. NAME OF FIRM
<b>Robert L. Portley, Project Manager</b>	<b>GLR Constructors</b>
17. SIGNATURE 	18. DATE OF SUBMISSION <b>8/19/91</b>

NSN 7540-01-142-5845

(41) 101

U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 381-526 (9016)

STANDARD FORM 1411 (10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.215-2(c)

CONTRACT PRICING PROPOSAL COVER SHEET		1. SOLICITATION/CONTRACT/MODIFICATION NO. DACW-69-88-C-0001	FORM APPROVED OMB NO. 3090-0118
NOTE: This form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6(b))			
2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)		3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT  N/A	3B. TELEPHONE NO.  304-675-7050
4. TYPE OF CONTRACT ACTION (Check)			
A. NEW CONTRACT		D. LETTER CONTRACT	
<input checked="" type="checkbox"/> B. CHANGE ORDER		E. UNPRICED ORDER	
C. PRICE REVISION/REDETERMINATION		F. OTHER (Specify)	
5. TYPE OF CONTRACT (Check)		6. PROPOSED COST (A+B+C)	
<input checked="" type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF <input type="checkbox"/> FPI <input type="checkbox"/> OTHER (Specify)		A. COST    B. PROFIT/FEE    C. TOTAL \$ 342,206.00    \$ 40,178.00    \$ 382,384.00	
7. PLACE(S) AND PERIOD(S) OF PERFORMANCE			

### Gallipolis Locks Replacement Contract DACW-69-88-C-001 (1987 - 1992)

8. List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this record is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)				
A. LINE ITEM NO.	B. IDENTIFICATION	C. QUANTITY	D. TOTAL PRICE	E. REF.
	See GLR Constructors' proposal transmitted via Serial Letter No. 91-245, dated July 29, 1991.  Re: Change Item No. 117			

9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (if available)	
A. CONTRACT ADMINISTRATION OFFICE  N/A	B. AUDIT OFFICE  N/A

10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? (If "Yes," identify)  <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete item 11B) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	11B. TYPE OF FINANCING (if one) <input type="checkbox"/> ADVANCE PAYMENTS <input checked="" type="checkbox"/> PROGRESS PAYMENTS <input type="checkbox"/> GUARANTEED LOANS
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s)) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	

14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)	
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal) <input type="checkbox"/> YES <input type="checkbox"/> NO	B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 or 3)? (If "Yes," specify in proposal the office to which submitted and if determined to be adequate) <input type="checkbox"/> YES <input type="checkbox"/> NO
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal) <input type="checkbox"/> YES <input type="checkbox"/> NO	D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal) <input type="checkbox"/> YES <input type="checkbox"/> NO

This proposal is submitted in response to the RFP contract, modification etc. in Item 1 and reflects our best estimates and/or actual costs as of this date.

15. NAME AND TITLE (Type)  Robert L. Portley, Project Manager	16. NAME OF FIRM  GLR Constructors
17. SIGNATURE  <i>Robert L. Portley</i>	18. DATE OF SUBMISSION  8/19/91

NSN 7540-01-142-9845

1411-101

U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 301-526 (9016)

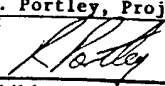
STANDARD FORM 1411 (10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.213-2(c)

CONTRACT PRICING PROPOSAL COVER SHEET		1. SOLICITATION/CONTRACT/MODIFICATION NO. DACW-69-88-C-0001	FORM APPROVED OMB NO. 3090-0116
NOTE: This form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6(b))			
2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)		3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT N/A	3B. TELEPHONE NO. 304-675-7050
3. TYPE OF CONTRACT (Check)		4. TYPE OF CONTRACT ACTION (Check)	
<input checked="" type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF <input type="checkbox"/> FPI <input type="checkbox"/> OTHER (Specify)		<input checked="" type="checkbox"/> A. NEW CONTRACT <input type="checkbox"/> D. LETTER CONTRACT <input checked="" type="checkbox"/> B. CHANGE ORDER <input type="checkbox"/> E. UNPRICED ORDER <input type="checkbox"/> C. PRICE REVISION/REDETERMINATION <input type="checkbox"/> F. OTHER (Specify)	
7. PLACE(S) AND PERIOD(S) OF PERFORMANCE		8. PROPOSED COST (A+B+C)	
		A. COST \$ 95,481.40	B. PROFIT/FEE \$ 11,172.75
		C. TOTAL \$ 106,654.15	

### Gallipolis Locks Replacement Contract DACW-69-88-C-0001 (1987 - 1992)

8. List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this total is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)

A. LINE ITEM NO.	B. IDENTIFICATION	C. QUANTITY	D. TOTAL PRICE	E. REF.
	See GLR Constructors' proposal transmitted via Serial Letter No. 91-213, dated July 5, 1991.  Re: Modification No. P00104 Change Item No. 176			

9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)	
A. CONTRACT ADMINISTRATION OFFICE  N/A	B. AUDIT OFFICE  N/A
10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? (If "Yes," identify)	11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete item 11B)
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))	11B. TYPE OF FINANCING (if any)
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<input type="checkbox"/> ADVANCE PAYMENTS <input checked="" type="checkbox"/> PROGRESS PAYMENTS
	<input type="checkbox"/> GUARANTEED LOANS
	13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)
	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)	
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)	B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 or DS-2)? (If "Yes," specify in proposal the office to which submitted and if determined to be adequate)
<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> YES <input type="checkbox"/> NO
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)	D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)
<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> YES <input type="checkbox"/> NO
This proposal is submitted in response to the RFP, contract, modification, etc. in item 1 and reflects our best estimates and/or actual costs as of this date.	
15. NAME AND TITLE (Type)	16. NAME OF FIRM
Robert L. Portley, Project Manager	GLR Constructors
17. SIGNATURE 	18. DATE OF SUBMISSION 8/19/91

NSN 7540-01-142-9845

1411-101

U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 381-526 (9016)

STANDARD FORM 1411 (10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.215-2(c)

# G L R CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box J-...  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-304

September 9, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Des Goyal

Subject: Concrete Backfill and Additional Forming in Rock Overbreak  
Areas  
Change Item No. 117

Gentlemen:

Reference is made to the above subject and specifically to Request for  
Clarification No. 427, dated August 29, 1991 (attached).

We confirm our agreement that this work falls within the scope of Change  
Item No. 117.

Sincerely,



Robert L. Portley  
Project Manager

RLP:GJ:ls

Enclosure

An Equal Opportunity Employer

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-313

September 11, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Ronald C. Harris

Subject: Contract Progress Payment No. 93  
Payment Ending: September 14, 1991

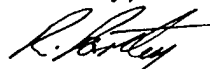
Gentlemen:

Transmitted herewith is our documentation for Contract Progress Payment of Bid Item work performed through September 14, 1991.

The total amount due the Contractor is \$6,337,387.73

The quantities in Bid Item 10 "Slurry Trench Cut-off Walls", Bid Item 269 "Portland Cement", Bid Item 270 "Pozzolan", and Bid Item 18 "Dental Treatment" have been revised to match the Government's quantities. In addition, all mass concrete quantities reflect "neat line" measurements. GLR Constructors reserves the right to pursue payment for any and all additional costs resulting from the excessive amount of incompetent rock encountered to date. These quantity reductions have been made solely to expedite the processing of this and future progress payments. In no way do these revisions signify acknowledgment of agreement with the Government's quantities completed to date.

Sincerely,



Robert L. Portley  
Project Manager

RLP:HMO:ls

Enclosures

An Equal Opportunity Employer

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-315

Septemberr 11, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Des R. Goyal

Subject: Supply Close Out  
Protective Coating  
Bid Item No. 19  
Specification Section 2F

Gentlemen:

Reference the Government's Serial Letter No. 1803, dated September 9, 1991.

Purchase Requisition 241368 for the referenced protective coating was submitted to the Government by Transmittal 2074A. By submittal of this purchase requisition, GLR Constructors has provided the Government with all required documentation for the supply of the protective coating.

Sincerely,



Robert L. Portley  
Project Manager

RLP:LKA:la

An Equal Opportunity Employer

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001

Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-340

October 1, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Des Goyal

Subject: Core Drilling  
Bid Item 31 A Through E  
Specification Section 2I

Gentlemen:


Reference is made to the above subject and specifically to your Serial Letter No. 1832, dated September 26, 1991.

Core sample photo for R59/1 was provided on Transmittal No. 2091, dated February 23, 1989.

Core sample photos labeled L24/1 were sent to you twice (Transmittal No. 2089, dated February 13, 1989 and Transmittal No. 2093, dated March 7, 1989). GLR Constructors is of the opinion that one of the above photos was mismarked and should be labeled L24/2.

If GLR Constructors can be of further assistance, please do not hesitate to contact the undersigned.

Sincerely,

  
Robert L. Portley  
Project Manager

RLP:GEM:ls

An Equal Opportunity Employer

**IF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE**  
(Read instructions on the reverse side prior to initiating this form)

DATE **2/13/89**

☒ NEW SUBMITTAL  
☐ RESUBMITTAL

REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the contractor)

FROM: <b>neer Engineers P.O. Box T Pt. Pleasant, WV 25550</b>	CONTRACT NO. <b>DACW69-88-C-0001</b>	TRANSMITTAL NO. <b>2089</b>
TO: <b>neer, WV 25502-0009</b>	PREVIOUS TRANS. NO. (If any)	

PROJECT TITLE AND LOCATION  
**Gallipolis Locks Replacement**

ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.)	MFG. OR CONTR. CAT. CURVE DRAWING OR BROCHURE NO. (See instruction No. 8)	NO. OF COPIES	CONTRACT REFERENCE DOCUMENT		FOR C E USE CODE
				SPEC. PARA. NO.	DRAWING SHEET NO.	
10	b. 35 MM Slides	Slides	1	10		F
11		Slides	1	10		F
12		Slides	1	10		F
13		Slides	1	10		F
14		Slides	1	10		F
15		Slides	1	10		F
16		Slides	1	10		F
17		Slides	1	10		F

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict compliance with the contract drawings and specifications except as otherwise stated.

NAME AND SIGNATURE OF CONTRACTOR: *[Signature]* IDV/1a

Section II

APPROVAL ACTION

NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY: *[Signature]* DATE: 15 Feb 89

INCLOSURES RETURNED (List by Item No.): None

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE <small>(Read instructions on the reverse side prior to initiating this form.)</small>									
<b>Section I</b> REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the contractor)			DATE <b>3/07/89</b>		<input checked="" type="checkbox"/> NEW SUBMITTAL <input type="checkbox"/> RESUBMITTAL				
<b>TO Resident Engineer</b> U.S. Army Corps of Engineers P.O. Box 9 Apple Grove, WV 25502-0009 <small>SPECIFICATION SEC. NO. (Cover only one section with each transmittal)</small>			<b>FROM GLR Constructors</b> P.O. Box T Pt. Pleasant, WV 25550 <small>PROJECT TITLE AND LOCATION</small>		CONTRACT NO. <b>DACW69-88-C-0001</b>		TRANSMITTAL NO. <b>2093</b> <small>PREVIOUS TRANS. NO. (If any)</small>		
<b>21 Gallipolis Locks Replacement</b>									
ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.)	MFG. OR CONTR. CAT. CURVE DRAWING OR BROCHURE NO. <small>(See instruction No. 8)</small>	P. NO. OF COPIES	CONTRACT REFERENCE DOCUMENT		FOR C.E. USE CODE			
				SPEC. PARA. NO.	DRAWING SHEET NO.				
64	Jaques b. 35 mm slides	Slides	1	10		F			
65		Slides	1	10		F			
66		Slides	1	10		F			
67		Slides	1	10		F			
68		Slides	1	10		F			
69		Slides	1	10		F			
70		Slides	1	10		F			
71		Slides	1	10		F			
72		Slides	1	10		F			
<b>REMARKS</b> I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.							NAME AND SIGNATURE OF CONTRACTOR 		
<b>Section II</b> APPROVAL ACTION									
<b>Section II</b> INCLOSURES RETURNED (List by Item No.)									
NONE									
NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY 					DATE <b>10 Mar 89</b>				
<b>ENG FORM 4025, Oct 84</b> <small>U.S. GOVERNMENT PRINTING OFFICE: 1984-457-071/25020</small>									

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE <small>(Read Instructions on the reverse side prior to initiating this form)</small>				DATE 2/23/89	NEW SUBMITTAL <input checked="" type="checkbox"/> RESUBMITTAL <input type="checkbox"/>
<b>Section I</b> TO: Resident Engineer U.S. Army Corps of Engineers P.O. Box 9 Apple Grove, WV 25502-0009		FROM: G.L.R. Constructors P.O. Box 7 Pt. Pleasant, WV 25550		CONTRACT NO. DACW69-88-C-0001	
SPECIFICATION SEC. NO. (Cover only one section with each transmittal) 21		PROJECT TITLE AND LOCATION Gallipolis Locks Replacement			
ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.)	MFG. OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. (See instruction No. 8)	NO. OF COPIES	CONTRACT REFERENCE DOCUMENT	
a.	b. 35 mm slides	c.	d.	SPEC. PARA. NO.	DRAWING SHEET NO. f.
1	M 43/2	Slides	1	10	
2	M 35/2	Slides	1	10	
3	M 39/2	Slides	1	10	
4	M 38/1	Slides	1	10	
5	M 37/2	Slides	1	10	
6	M 37/1	Slides	1	10	
7	M 36/1	Slides	1	10	RECEIVED
8	M 36/2	Slides	1	10	FEB 23 1989
9	R 59/1	Slides	1	10	G.L.R.
REMARKS					
I certify that the above submitted items have been reviewed in detail and are correct and in strict compliance with the contract drawings and specifications except as otherwise indicated. NAME AND SIGNATURE OF CONTRACTOR <i>[Signature]</i> JDV/1a					

Section II	
INCLOSURES RETURNED (List by Item No.) None	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY Ronald C. Harris DATE 24 Feb 89

ENG FORM 4025, Oct 84 (SR 415.1-10) EDITION OF JUL 81 IS OBSOLETE. (Proponent: DAEN-ECC) SHEET 2 OF 2  
 U.S. GOVERNMENT PRINTING OFFICE: 1984-331-821/2500

# G L R CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-453

December 31, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

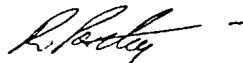
Attention: Mr. Des Goyal

Subject: Hazard Analysis - Rock Drilling and Blasting  
Addendum No. 2

Gentlemen:

Enclosed herewith is a copy of Addendum No. 2 for Job Hazard Analysis on rock drilling and blasting operations.

Sincerely,



Robert L. Portley  
Project manager

RLP:CL:nc

Enclosure

An Equal Opportunity Employer

# GLR CONSTRUCTORS

GALLIPOLIS LOCKS REPLACEMENT

CONTRACT DACW69-88-C-0001  
Post Office Box T  
Point Pleasant, WV 25550  
(304) 675-7050

Serial Letter No. 91-451

December 23, 1991

Resident Engineer  
U.S. Army Corps of Engineers  
Huntington District  
P.O. Box 9  
Apple Grove, WV 25502-0009

Attention: Mr. Des Goyal

Subject: Fill Weep Holes with Pea Gravel  
Change Item No. 316

Re: Government Serial Letter No. 1910, dated November 21, 1991

Gentlemen:

Per the above referenced letter the Government requested GLR Constructors to provide a cost proposal to incorporate the subject additional work into the Contract.

Pursuant to Contract Clause 59 - "Changes", GLR Constructors herewith proposes an increase to the contract price and a contract modification is requested to provide the following:

BID ITEM NUMBER	DESCRIPTION	QUANTITY	UNIT	PRICE	AMOUNT
New	Pea Gravel for Weep Holes	1	Job	LS	\$18,548.60

This proposal is based solely on the usual cost elements such as labor, material and normal markups and does not include any amount for changes in sequence of work, delays, disruptions, rescheduling, extended overhead, acceleration and/or impact costs.

An Equal Opportunity Employer

We therefore, expressly reserve the right to make claim for any and all of the aforementioned exclusions and related items of costs prior to any final settlement of this contract.

Sincerely,

*Robert L. Portley*

Robert L. Portley  
Project Manager

RLP:ALK:ls

Enclosure

GLR CONSTRUCTORS  
GALLIPOLIS LOCKS IN CANAL  
CHANGE ITEM NO. 316

FILL WEEP HOLES WITH PEA GRAVEL

\*\*\*\*\*

SUMMARY OF ELEMENTS OF COSTS

Subcontractor Costs.....\$				0.00
Subcontract Bond.....\$	0.00 @	0.00%		0.00
			Sub Total .....	0.00
GLR Direct Field Costs.....\$				13,309.93
			Sub Total .....	13,309.93
Overhead.....\$	13,309.93 @	22.00%*		2,928.18
			Sub Total .....	16,238.11
Profit.....\$	16,238.11 @	12.00%		1,948.57
			Sub Total .....	18,186.69
Bond and General Liability.\$	18,186.69 @	1.99%*		361.92
			Total Cost.....\$	18,548.60
				=====

\* Based on verbal agreement and tentative resolution of  
Change Item 217 - 1989 Overhead Audit Findings.

## CONSTRUCTION OPERATION DETAIL

CHANGE ITEM NO. 316

GALLIPOLIS LOCK REPLACEMENT

FILL WEED HOLES WITH PEA GRAVEL

TAKEOFF QTY : 1  
UNIT : JOB

DETAIL ID	QTY	U/M	DESCRIPTION	WORK HOURS	COST	LABOR	PERM MATL	EQUIPMENT	CONSUMABLE	SUB-COST
LABOR	1.000	EA	OPERATOR CL I RT 980	42.50	25.740	1093.95	0.00	0.00	0.00	0.00
LABOR	1.000	EA	OPERATOR CL II LOADER	9.00	24.220	217.98	0.00	0.00	0.00	0.00
LABOR	1.000	EA	OPERATOR CL II BOBCAT	16.00	24.220	387.52	0.00	0.00	0.00	0.00
LABOR	1.000	EA	LABORER FOREMAN	63.50	21.590	1370.97	0.00	0.00	0.00	0.00
LABOR	4.000	EA	LABORER CL IV	63.50	20.390	5179.06	0.00	0.00	0.00	0.00
LABOR	1.000	EA	TEAMSTER CL VI	6.00	21.630	129.78	0.00	0.00	0.00	0.00
LABOR	1.000	EA	LABORER CL IV BOOM TRUCK	4.00	20.390	81.56	0.00	0.00	0.00	0.00
EQUIP	1.000	EA	LNT 8000 BOOM TRUCK	4.00	21.440	0.00	0.00	85.76	0.00	0.00
EQUIP	1.000	EA	LTS 8000 DUMP TRUCK	2.00	23.200	0.00	0.00	46.40	0.00	0.00
EQUIP	1.000	EA	GROVE RT 980 CRANE	42.50	70.440	0.00	0.00	2993.70	0.00	0.00
EQUIP	1.000	EA	CAT 966 LOADER	9.00	41.070	0.00	0.00	369.63	0.00	0.00
EQUIP	1.000	EA	BOBCAT 843	16.00	6.500	0.00	0.00	104.00	0.00	0.00
EQUIP	1.000	EA	185 AIR COMPRESSOR	25.00	5.750	0.00	0.00	143.75	0.00	0.00
PM	30.000	TN	PEA GRAVEL	0.00	9.500	0.00	285.00	0.00	0.00	0.00
SUBTOTAL					12489.06	8460.82	285.00	3743.24	0.00	0.00
O/T @ 4.5% OF LABOR					380.74					
SMALL TOOLS 5% OF LABOR:					423.04					
WEST VIRGINIA SALES TAX @ 6% OF MATLS.					17.10					
TOTAL COST OF OPERATION:					13,309.93					

01 LABOR BASED ON 40 HR/WK COMPOSITE RATE EFFECTIVE 7/1/91

02 710 EA WEED HOLES TOTALING 9,323 LF

03 LABOR AND EQUIPMENT TIME INCLUDES CLEAN UP OF AREAS, REMOVAL OF PLUGS, WASHING OUT HOLES,  
CONTROL OF WATER AND FILLING HOLES WITH PEA GRAVEL

04 AREAS UNDER WATER AND ICE COVERED

05 DUMP TRUCK TO HAUL CLEANED UP MATERIAL TO WASTE

January 4, 1989 S/N 493

Construction Division  
Gallipolis Resident Office

SUBJECT: Hazard Analysis for Rock Drilling and Blasting  
Construction of the New Gallipolis Locks  
Contract No. DACW69-88-C-0001

G.L.R. Constructors  
P.O. Box "T"  
Point Pleasant, West Virginia 25550

Gentlemen:

Reference is made to your serial letter number 88-398, transmitting your proposed hazard analysis for the rock drilling and blasting.

Your proposed hazard analysis is accepted. Prior to starting blasting, all employees at the site shall be informed that explosives will be used at the site and made aware of the signaling procedure to be used.

You are reminded that this acceptance does not relieve you of the responsibility to take any and all additional measures necessary to ensure safety.

Sincerely,

RONALD C. HARRIS  
Authorized Representative  
Of Contracting Officer

CF:  
CEORH-CD  
CEORH-CT w/orig. contractor's letter  
CEORH-DP (C. Bennett)

February 27, 1989 S/N 613

Construction Division  
Gallipolis Resident Office

SUBJECT: Survey Controls  
Construction of the New Gallipolis Locks  
Contract No. DACW69-88-C-0001

G.L.R. Constructors  
P.O. Box "T"  
Point Pleasant, West Virginia 25550

Gentlemen:

This letter will confirm information verbally furnished  
Mr. John Zito of your office by Mr. Pat Morgan of my office.

As a result of communications with your staff, and a  
recent check of the control points for the subject  
contract, the following coordinates are provided for the  
corresponding controls.

Station	Northing	Easting
PED-6	251880.756	2090139.910
PED-5	248672.860	2087855.609
PED-4	249579.945	2089525.564

Should you have any comments and/or concerns you may  
contact my office.

Sincerely,

RONALD C. HARRIS  
Authorized Representative  
Of Contracting Officer

CF:  
CEORH-CD  
CEORH-CT  
CEORH-DP (C. Bennett)

# DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL

CEORH-ED-GG

SUBJECT

Dental Treatment, Construction of the new  
Gallipolis Locks; Contract # DACW69-88-C-  
0001

TO CEORH-CD

FROM CEORH-ED

DATE 12 January 1990  
Hornbeck / 5234

CMT 3

Based upon a review of the specifications and our discussions with the project staff, we concur with the method of payment used to date. Final cleanup is intended to remove loose and drummy rock, while dental treatment is intended to be used to achieve a geometry which is suitable for placement of mass concrete.

*Kennard M. Stoddell*

FOR Charles E. Vandavelde  
Chief, Engineering Division

CF:

CEORH-ED-A

CEORH-ED-D

CEORH-ED-GG

TO: CEORH-CD-GAL FROM: CEORH-CD

DATE: 19 January 1990  
GREENFIELD/mw/5727

CMT4

Forwarded for your information.

Attachments

CF:

CEORH-CD

-CD-A

-CD (Greenfield)

*Joseph B. Turner*

JOSEPH R. TURNER, III  
Chief, Construction Division

DA FORM 2496  
AUG 80

PREVIOUS EDITIONS WILL BE USED

★ GPO : 1987 O - 172-425

13-5-3

March 20, 1989

S/N 646

Construction Division  
Gallipolis Resident Office

SUBJECT: Rock Excavation  
Construction of the New Gallipolis Locks  
Contract No. DACW69-88-C-0001

G.L.R. Constructors  
P.O. Box "T"  
Point Pleasant, West Virginia 25550

Gentlemen:

This letter will confirm information verbally provided members of your staff on March 1, 1989.

As you are aware, various procedures have been utilized for presplitting along interior and exterior corners of the lockwalls. However, no method has been fully successful in leaving exterior rock corners intact.

It is the government's position that every possible effort must be utilized to keep exterior rock corners intact. Therefore, presplit holes may be drilled on a 45 degree line from exterior rock corners to a point that intersects the neat line dimension of the adjacent wider monolith. This procedure may be utilized to prevent propagation of the presplit across the exterior rock corner, when an offset of 4' or less exist between two adjacent monoliths in plan view. (See example #1, SK-Rock Excavation.) The 45 degree line used for presplitting in the above procedure will be the neat line dimension utilized for rock excavation and concrete payment.

When the offset dimension between adjacent monoliths exceeds 4 feet in plan view, the interior corner will be presplit to a point 4 feet from the exterior corner. The exterior corner may be line drilled to a point 4 feet in either direction of the exterior corner. The government will proceed to pay for the necessary line drilling of these corners as outlined in the contract for line drilling. (See ex. #2, SK-Rock-Excavation.)

In addition to the above procedures, it has been determined necessary to line drill all exterior rock corners adjacent to monoliths M-7, M-13, and M-29. The government will proceed to pay for the necessary line drilling of these corners as outlined in the contract for line drilling. (See ex. #3, SK-Rock Excavation.)

The government has also determined that for vertical steps of less than 2' between adjacent monoliths line drilling may be deleted. If line drilling is deleted for less than 2' steps down, rock must be excavated from the highest foundation along a 45 degree line extending to a point which intersects the designed elevation of the lower monolith. The 45 degree line will constitute the neat line dimension utilized for rock excavation and concrete payment. (See ex. #4, Sk-Rock Excavation.)

The reinforcing steel shall be field adjusted to fit all cases in which the above alterations are utilized at no additional cost to the government.

Should you have any comments and/or concerns you may contact my office.

Sincerely,

Ronald C. Harris  
Authorized Representative  
Of Contracting Officer

CF:  
CEORH-CD  
CEORH-CT  
CEORH-DP (C. Bennett)

CEORH-OC (CEORH-CD/15 May 89) (1180)  
SUBJECT: Payment for Sill Excavation, Construction of the New Gallipolis  
Locks, Contract No. DACW69-88-C-0001

TO: CEORH-CD

FROM: CEORH-OC

DATE: 14 July 1989  
Williams/sda/5261

CMT 2

1. We have reviewed the attached package and GLR's claim relative to payment for sill excavation and opine as follows:
2. We concur that sill excavation is to be measured for payment purposes, as provided by Section 2F, paragraph 19.3.3, based on the volume of material excavated in a sill excavation area using the sill excavation techniques in paragraph 12.6 (primarily), and not based on the location of the excavation and/or the type of blasting only.
3. It is our understanding that GLR used the techniques for excavating material classified as "Rock Excavation" to excavate the material in question (i.e., the top portion of rock in the sill areas) as opposed to using sill excavation techniques and was paid accordingly under Bid Item No. 12, "Rock Excavation". We think such was proper.

*E. W. Eversole*  
EDWARD W. EVERSOLE  
District Counsel

# DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL

CEORH-CD-A

SUBJECT

Payment for Sill Excavation, Gallipolis  
Locks, Contract No. DACW69-88-C-0001

TO

✓ CEORH-CD-GAL

FROM

CEORH-CD

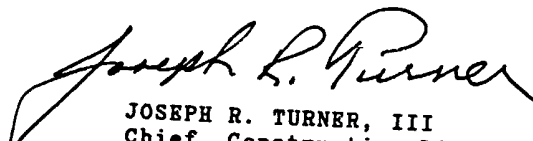
DATE

13 Nov 89

CMT 1

SHELDON/tam/5275

1. Attached are comments from Office of Counsel and Engineering Division relative to excavation of the sill area.
2. They concur that your interpretation of the measurement for payment is proper.

  
JOSEPH R. TURNER, III  
Chief, Construction Division

CF:  
CEORH-CD-A  
CEORH-CD

DA FORM 2496  
AUG 80

PREVIOUS EDITIONS WILL BE USED

★ GPO : 1987 O - 172-428

CEORH-ED-B

CEORH-CD

Gallipolis Locks in Canal Project,  
Payment for Sill Excavation Claim

CEORH-ED

23 May 1989  
Budrus/5009  
*as 7/8/89*

1. Reference:

- a. CEORH-CD DF, dated 15 May 1989, subject as above (Encl. 1).
  - b. CEORH-ED-GG MFR, dated 17 May 1989, subject as above (Encl. 2).
2. Per enclosure 2, Engineering Division recommends that no additional payment be made for this claim.

2 ENCL.  
as

*Charles E. VanDevelde*  
FOR CHARLES E. VANDEVELDE  
Chief, Engineering Division

# DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL		SUBJECT	
CEORH-CD (1180)		Payment for Sill Excavation, Construction of the New Gallipolis Locks, Contract No. DACW69-88-C-0001	
TO	CEORH-CT CEORH-ED CEORH-OC ✓	FROM	CEORH-CD
		DATE	15 MAY 89 CMT 2 GREENFIELD/jks/5727 <i>AS</i>
CMT 1			
<p>1. Forwarded is a claim relative to the measurement and payment for Bid Item No. 14, Sill Excavation.</p> <p>2. Reference Contract Specifications Section 2F - "Excavation" paragraph 2.3.2; 12.6 and 19.3.3 all "Sill Excavation."</p> <p>3. The issue centers on the limits for measurement for the bid item. Rock excavation is paid under three different items - "Rock Excavation", "Sill Excavation", and "Buffer Zone Excavation". These three items were set up to protect rock faces to be left in place. Each have different requirements and, therefore, different costs. For instance, sill excavation would have large pieces of rock left after blasting which would require additional mechanical breaking before they could be removed. The regular rock excavation would not require this extra effort. Normally, the measurement and the payment item would define these different types by <u>location</u>. However, in this contract they are defined by <u>excavation procedure</u>. The problem is that the upper portion of rock in the gate sill location was not removed by the gate sill procedure. Instead, the Contractor was able to remove it with the "Rock Excavation" procedure. The Contractor claims the sill payment should be used since it was in the sill area. The Government thinks it should be the rock excavation item because of the method. The Contractor contends that measurement should include all areas of the sill excavation from elevation 497 down to the foundation bottom, 484 or so. The Government measurements include only the volume as defined by the specialized procedures to protect the rock surface that will remain in place. (See paragraph 12.6 Sill Excavation)</p> <p>4. The contractor attempts to reinforce his position by reviewing the Government estimate calculations showing the quantity approximates the estimated quantity. He does this by utilizing a top elevation of 497 as did the Government in their estimate.</p> <p>5. The Resident Engineer and staff have taken the position that payment for "Sill Excavation" should only include that rock which is excavated by the method described in subparagraph 12.6 and any rock in the sill area excavated by other means should be paid for under bid Item No. 12 "Rock Excavation." The contractor did line drill the entire sill from the top of rock elevation 497 however, his rock operations removed rock from elevation 497 to 495+ and also a portion of the sill area down to approximate elevation 488+. His contention is that he should be paid for any rock between the line drilled surfaces upstream and downstream and the side buffer zones with the top of rock at elevation 497 thus ignoring the shown top of rock at 495+. (See drawing 0-L26B-20/135 and 136 for a better understanding)</p>			

DA FORM 2496  
AUG 80

PREVIOUS EDITIONS WILL BE USED

CEORH-CD (1180)

SUBJECT: Payment for Sill Excavation, Construction of the New Gallipolis Locks, Contract No. DACW69-88-C-0001

6. The contractor is basing the total quantity on the limits as defined by the method of drilling and blasting while the payment paragraph 19.3.3, specifically states that measurement for payment is based upon the volume of material excavated using sill excavation techniques. Paragraph 12.6 outlines that sill excavation shall consist of light blasting supplemented by mechanical methods so that fragmentation will not be the controlling factor. The blast shall break the rock but the fragment size shall be such that removal by conventional excavating equipment is not possible without the use of supplementary mechanical methods such as hydraulic rock splitters on boom-mounted demolition hammers. - - - Where sill excavation and buffer zone excavation lie adjacent to each other, the buffer zone excavation shall be completed before the sill excavation at a given elevation.

7. Your response is requested by 23 May 1989.

*Joseph R. Turner*  
JOSEPH R. TURNER, III  
Chief, Construction Division

CF:  
CEORH-CD

GEORD-ED-G

12 July 1989

MEMORANDUM FOR RECORD

SUBJECT: Site Visit to Gallipolis Lock Construction Project

1. Purpose: The purpose was to inspect rock excavation and treatment for construction of the Gallipolis Locks and to provide an opportunity for professional development for geologists and geotechnical engineers from ORD districts.
2. Place and Date: The visit took place at the Gallipolis Locks and Dam, WV on 21 June 1989.
3. Attendees: See attached list.
4. Background: This trip was in response to my request to Messrs. Steve Hornbeck, GEORH-ED-G and Pat Oshel, GEORH-CD for a Gallipolis site visit for geologists and geotechnical engineers from Louisville, Nashville and Pittsburgh Districts. Because of the diminishing number of large civil works projects throughout the Corps, many geotechnical professionals will be denied an opportunity to see and gain experience from a project under construction. Inspection of a project undergoing foundation development and treatment would provide valuable information and experience to this end. With concurrence and strong support of their superiors, Messrs. Hornbeck and Oshel made all necessary arrangements for the site visit.
5. Observations: An excellent project information briefing was presented by Messrs. Hornbeck, Oshel and David Nugen, Gallipolis Project Geologist. Mr. Hornbeck covered project design emphasizing geotechnical aspects. Mr. Nugen covered construction details, with emphasis on geotechnical.

Following the briefing, Mr. Nugen led the site inspection, beginning with a vehicle tour of overall construction operations and concluding with a walking inspection of rock foundation development and treatment. As Mr. Hornbeck noted in his briefing, sandstone is predominant in the downstream end of the project, siltstone is predominant in the middle portion and weaker less competent claystone is the primary foundation rock in the upstream end. Rock excavation and foundation development are progressing well with the contractor having made the first concrete placement the previous week. (Full concrete production should be starting in a few weeks.)

Excavation of rock is continuing from general top of rock elevation 497 to general foundation elevation 484 with elevation differences for individual monoliths. Excavation of final faces is accomplished using a variety of blasting techniques including presplitting, line drilling and buffer zone blasting. Difficulties holding exterior corners are continuing as noted in a previous site visit report (GEORD-ED-G MFR, subject: Site Visit to Gallipolis Lock Construction Project, dated 28 March 1989). The upper sandstone between the downstream culvert crossover excavation had been damaged and portions of this rock will have to be removed. Air and water sensitive claystone are protected by application of an emulsion binder which forms a surface seal. (No binder was applied during the visit.)

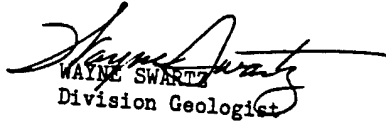
CEORD-ED-G

SUBJECT: Site Visit to Gallipolis Lock Construction Project

12 July 1989

6. Discussion: Following the inspection, we returned to the Resident Office and I met briefly with Messrs. Oshel and Nugen. I suggested that scaling of loose rock should be performed at a number of places along the excavation and minor touch-up of claystone with Aerospray Binder was necessary. Mr. Nugen agreed noting that each of these operations must be performed continually.

7. Conclusions: The project looks very good. Overall rock excavation and treatment are proceeding as designed. The visitors from the other three districts were very complimentary of project and personnel, especially Messrs. Hornbeck and Nugen. Huntington District, and particularly personnel involved with the site visit, should be commended for hosting the visit and for sharing their lessons learned.

  
WAYNE SWARTZ  
Division Geologist

CF:

CEORD-CO-C

CEORH-ED-G

CEORH-CD

✓CEORH-CD/Gallipolis R.O.

# Site Visit - Gallipolis L/D

## Attendees

Steve Hornbecck	CEORH-ED-GG	304-529-5234
Raynell Napier	CEORH-ED-GM	304-529-5224
F. Wayne Swartz	CEORD-ED-G	513-684-3028
Marvin Simmons	CEORN-ED-G	615-736-5686
James Brown	CEORP-ED-GG	412-644-3595
Joe Melnyk	CEORN-ED-G	615-376-5685
Kathleen Pebley	CEORP-ED-GG	412-644-5142
Dave Carlson	CEORP-ED-G	412-644-2844
Gary D'Urso	CEORP-ED-GG	412-644-4126
Steve Brewster	CEORH-ED-GM	304-529-5224
Tommy Haskins	CEORN-ED-G	615-736-5691
Jim Sekela	CEORP-ED-G	412-644-6947
Brian Greene	CEORP-ED-GG	412-644-4124
"Buzz" Stevenson	CEORP-ED-G	412-644-4125
David Black	CEORL-ED-G	502-582-5730
Marshall Fausold	CEORP-ED-G	412-644-4123
Ken Parsons	CEORL-ED-G	502-582-5730
Bob Yost	CEORH-ED-GG	304-529-5279
Loren Christman	CEORL-ED-G	502-582-5730
Chuck Greenewelt	CEORH-ED-GG	304-529-5234
Pat Oshel	CEORH-CD	304-529-5486

July 18, 1989

S/N 855

Construction Division  
Gallipolis Resident Office

SUBJECT: Preliminary Cleanup of Monoliths  
Construction of the New Gallipolis Locks  
Contract No. DACW69-88-C-0001

G.L.R. Constructors  
P.O. Box "T"  
Point Pleasant, West Virginia 25550

Gentlemen:

Reference is made to your serial letter number 89-191 concerning the subject matter.

The interpretation presented in my serial letter number 834 should clarify my position on preliminary and final cleanup. I stated that preliminary cleanup will be utilized for foundation inspections and mapping prior to final cleanup. Therefore, preliminary cleanups will not be eliminated as originally thought. I continue to disagree with your opinion that by eliminating the work under bid item 16, Preliminary Cleanup, would increase your cost under bid item 17, Final Cleanup. However, since preliminary cleanup will not be eliminated, your notice of a constructive change is no longer considered applicable.

Should you have any questions and/or concerns you may contact this office.

Sincerely,

Ronald C. Harris  
Authorized Representative  
Of Contracting Officer

CF:  
CEORH-CD  
CEORH-CT w/orig. contractor's letter  
CEORH-DP (C. Bennett)

April 18, 1989

S/N 717

Construction Division  
Gallipolis Resident Office

SUBJECT: Preliminary Cleanup R-37 thru R-47 and M-15  
thru M-25  
Construction of the New Gallipolis Locks  
Contract No. DACW69-88-C-0001

G.L.R. Constructors  
P.O. Box "T"  
Point Pleasant, West Virginia 25550

Gentlemen:

Reference is made to Section 2F, Paragraph 15.2 of the Specifications.

This letter will confirm information provided your Mr. John Zito on April 10, 1989, by Mr. Pat Morgan of my office.

It has been determined that no preliminary cleanup is necessary at this time for monoliths R-37 thru R-47 and M-15 thru M-25. You may proceed with a temporary earth cover for these monoliths.

It is requested that you notify the government as foundations are exposed, so as to allow for preliminary cleanup and the installation of the temporary earth cover within the seven (7) days specified in Paragraph 17.2 of Section 2F.

Should you have any comments and/or concerns you may contact my office.

Sincerely,

Ronald C. Harris  
Authorized Representative  
Of Contracting Officer

July 18, 1989

S/N 855

Construction Division  
Gallipolis Resident Office

SUBJECT: Preliminary Cleanup of Monoliths  
Construction of the New Gallipolis Locks  
Contract No. DACW69-88-C-0001

G.L.R. Constructors  
P.O. Box "T"  
Point Pleasant, West Virginia 25550

Gentlemen:

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Should you have any questions and/or concerns you may contact this office.

Sincerely,

Ronald C. Harris  
Authorized Representative  
Of Contracting Officer

CF:  
CEORH-CD  
CEORH-CT w/orig. contractor's letter  
CEORH-DP (C. Bennett)

-2-

FINDINGS OF FACT

1. On October 23, 1987, the United States of America, represented by Colonel Robert D. Brown III and S.J. Groves and Sons Company (Sponsor); Guy F. Atkinson Construction Company; Dillingham Construction Company, N.A., Inc.; Harbert International; doing business as G.L.R. Constructors (hereinafter referred to as GLR) entered into Contract No. DACW69-88-C-0001 (Tab 4). Such construction contract was entered into for the estimated amount of \$217,622,583.00 and is entitled, "Construction of Locks in Canal, Gallipolis Locks and Dam, Ohio River (West Virginia)."
2. The contract requires completion within 1680 calendar days after the date of the Notice to Proceed. The Notice to Proceed letter was acknowledged on November 20, 1987 (Tab 5).
3. Pertinent clauses relative to this dispute are:
  - A. Contract Clause 44 entitled "DISPUTES".
  - B. Contract Clause 59 entitled "CHANGES".
  - C. Contract Clause 72 entitled "CONTRACT PRICES - BIDDING SCHEDULES".
  - D. Technical Contract requirements, Division 2, Site Work, Section 2F - Excavation.
4. Relevant contract drawings are:
  - A. 0-L26-20/135
  - B. 0-L26-28/136
5. Progress Payment Estimates:
  - A. No. 35, dated March 25, 1989
  - B. No. 36, dated April 10, 1989
6. By letter, dated April 24, 1989, your serial letter No. 89-170, you submitted your claim for additional payment for sill excavation in the amount of \$5040.00. You further state that you will continue to submit Progress Payment Estimates for all rock excavation at the sill locations under the Bid Item 14 unit price.

-3-

ANALYSIS

It is the position of the Government that Sill Excavation is to be measured for payment purposes, as provided by Section 2F paragraph 19.3.3, that is, based on the volume of material excavated, in a sill excavation area, using the sill excavation techniques, and not based on the location of the excavation only.

The contract is very specific as to how sill excavation is to be measured for payment purposes. It states in Section 2F, paragraph 19.3.3 Sill Excavation: "Sill excavation will be measured for payment based on the volume of material excavated using sill excavation techniques previously specified... ."

The specialized techniques for sill excavation are provided by paragraph 12.6 of Section 2F:

Sill Excavation. Excavation of those areas on or against which the concrete for the various gate sills will be placed will require specialized procedures to protect the rock that will remain in place. Sill excavation shall consist of light blasting supplemented by mechanical methods so that fragmentation will not be the controlling factor in the design of the blast. The blast shall be designed so that the rock is broken but the fragment size is such that removal by conventional excavating equipment is not possible without the use of supplementary mechanical methods such as hydraulic rock splitters, or boom-mounted demolition hammers such as those... . Additional requirements for sill excavation are contained in paragraphs, Line Drilling, and Buffer Zone Excavation.

Only rock excavation using sill excavation techniques are to be measured and paid for under Bid Item 14, "Excavation, Sill". You elected not to use these specialized procedures to remove the top portion of rock from the sill areas. You excavated the quantity of material in question using the continuous systematic blasting, ripping, or wedging techniques for excavating material classified as "Excavation, Rock", and were paid for accordingly under Bid Item No. 12, "Excavation, Rock".

-4-

DECISION

Pursuant to the foregoing discussion, I find no basis for your claim for additional costs and, therefore, deny the same. This is my final decision as Contracting Officer. This decision may be appealed to the Corps of Engineers Board of Contract Appeals. Should you decide to make such an appeal, you must mail or otherwise furnish written notice thereof to the Corps of Engineers Board of Contract Appeals, Ruth Price, Recorder, Washington, D.C. 20314, within 90 days from the date you receive this decision. A copy of the notice shall be furnished to the Contracting Officer from whose decision the appeal is taken. The notice shall indicate that an appeal is intended, shall reference this decision, and identify the contract by number. For appeals under the Disputes Clause, you may, solely at your election, proceed under the Board of Contract Appeals small claims procedure for claims \$10,000 or less or the accelerated procedure for claims \$50,000 or less. In lieu of appealing to the Corps of Engineers Board of Contract Appeals, you may bring an action directly in the U.S. Claims Court within 12 months of the date you receive this decision.

The rules of the Corps of Engineers Board of Contract Appeals will be made available to you by the Recorder of the Board.

Sincerely,

Thomas E. Farewell  
Colonel, Corps of Engineers  
Contracting Officer

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

(COGLSEX1)  
August 1, 1989

Construction Division  
Contract Administration Branch

SUBJECT: Contracting Officer's Decision - Payment for  
Sill Excavation (Rock) under Bid Item No. 14. Contract  
No. DACW69-88-C-0001, Construction of Locks in Canal,  
Gallipolis Locks and Dam, Ohio River (West Virginia).

GLR Constructors  
Post Office Box T  
Point Pleasant, West Virginia 25550

Gentlemen:

By letter dated April 24, 1989, your serial letter  
number 89-170 (Tab 3), you submitted a claim in the  
amount of \$5,040.00 and requested a Contracting  
Officer's decision regarding the Government's position  
of making payment for Sill Excavation under Bid Item  
No. 14 from below approximate elevation 495.0 in lieu  
of from elevation 497.0, the approximate top of rock.

Tab numbers mentioned herein refer to the location  
of the document in the potential appeal file.

SUMMARY OF CLAIM

You maintain that specialized blasting operations  
associated with sill excavation substantially differs  
from that for general excavation. You maintain that  
the blasting operations for Sill Excavation begins at  
the top of rock elevation (approximate elevation 497.0)  
and therefore, payment should be made under Bid Item 14  
for all excavation of rock at the sill locations. You  
take exception to the alleged Government's position  
that sill excavation (Bid Item 14) is only to be paid  
for below approximate elevation 495.0.

# POSITION FORM

Form, see AR 340-15. The proponent agency is TAGO

OFFICE SYMBOL

CEORH-CD-GAL

SUBJECT

Dental Treatment  
Construction of the New Callipolis Locks  
Contract No. DACW69-88-C-0001

TO CEORH-CD

FROM

CEORH-CD-GAL

DATE

15 November 1989 CMT1

MORGAN/cdh/576-9901

1. Reference is made to Section 2F, Paragraph 16, 16.1, 16.2, and 19.7 of the subject contract.
2. The contractor has brought to my attention that he does not agree with the criteria being utilized for measurement of dental treatment. To date the government has paid for dental treatment based on the volume of concrete necessary to fill voids, crevices, depressions, joints and etc., to an elevation so that three (3) inch mass concrete can be satisfactorily placed without vibration problems and concerns for voids. The contractor has stated that this quantity is insufficient to adequately address the cost associated with the item. In several instances, the quantity of concrete placed back to a satisfactory foundation is only a portion of the excavation required to remove unsound and drummy rock. This required excavation is considered by the contractor to be a major portion of the cost of dental treatment and is not covered when payment is based on the quantity of concrete placed back.
3. The government's criteria for payment of dental treatment has been predicated on the interpretation of dental treatment requirements as well as preliminary and final cleanup. Any excavation of depressions, crevices, and etc., not replaced with dental concrete has been considered as part of final cleanup.
4. It is requested that guidance be provided as to the intended criteria to be used for measurement of dental treatment. Should the measurement be based on the quantity of dental concrete placed to achieve a satisfactory foundation for additional mass concrete, or should the amount of excavation in total preparation for dental treatment be the determining criteria?
5. It is requested that guidance be provided by 4 December 1989, as this is a continuing process.

  
RONALD C. HARRIS  
RESIDENT ENGINEER

DA FORM 2496  
AUG 80

PREVIOUS EDITIONS WILL BE USED

13-5-21

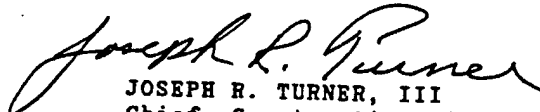
CEORH-CD (CEORH-CD-GAL/15 NOV 89) (1180)  
SUBJECT: Dental Treatment, Construction of the New Gallipolis Locks;  
Contract No. DACW69-88-C-0001

TO CEORH-ED-B

FROM CEORH-CD

DATE 13 DEC 89 CMT 2 *by*  
Greenfield/jks/5727

1. Furnished for your review and guidance.
2. This subject was discussed on 12 December 1989 with Messrs. Bob Yost, Steve Hornbeck of CEORH-ED and representatives of Construction.

  
JOSEPH R. TURNER, III  
Chief, Construction Division

CF:  
CEORH-CD (Greenfield)  
CEORH-CD-GAL

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT IDACH69-88-C-8881

SUBJECT: STEEL PIPE FOR FOUNDATION DRILLING AND GROUTING

SPEC REFERENCE: ZJ IP4.6 DRAWING REFERENCE: GLR DWG N-1, SHEET 3 OF 4

QUESTIONS: THE ATTACHED SKETCH SHOWS A MISALIGNED GROUT PIPE FOR A SECONDARY HOLE IN L-22. FIELD PERSONNEL ATTEMPTED TO CORRECT THIS PROBLEM WITH A REPLACEMENT PIPE AS SHOWN. NEITHER HOLE CAN BE DRILLED FOR PHASE III FOUNDATION DRILLING AND GROUTING.

GLR REQUESTS THE GOVERNMENT APPROVE DRILLING AND GROUTING ONE OF THE ADJACENT TERTIARY HOLES IN PLACE OF THE MISALIGNED SECONDARY GROUT HOLE.

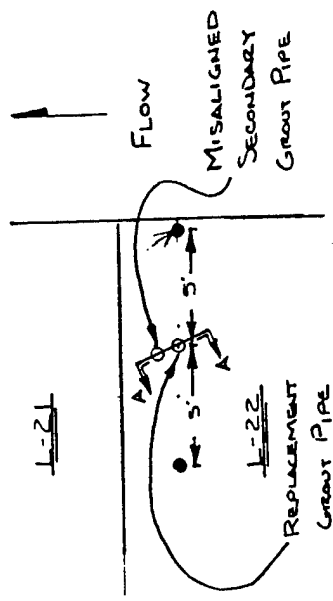
GLR CONSTRUCTORS: James A. Whitworth DATE: April 1, 1991

RESPONSE: THE ATTEMPT WILL BE MADE TO DRILL THE REPLACEMENT PIPE. IF CONTACT WITH THE ORIGINAL PIPE IS MADE, DRILLING WILL BE STOPPED. FOOTAGE WILL BE PAID FOR AT REGULAR PRICE OF \$9.00 A FOOT. IN THAT CASE THE TWO TERTIARY ON EITHER SIDE OF THE SECONDARY WILL BE DRILLED. PAYMENT WILL BE MADE FOR ONE OF THE HOLES, AT REGULAR PRICE OF \$9.00 A FOOT.

PROJECT GEOLGIST  
RESIDENT ENGINEER:

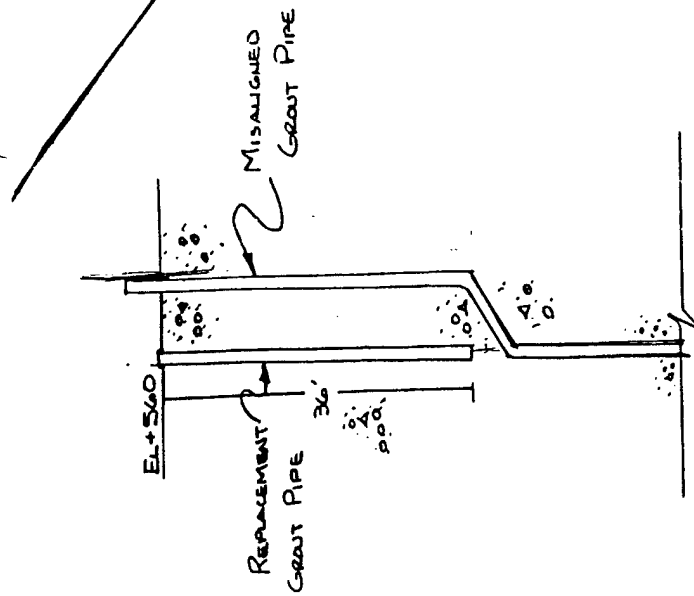
Jerry M. Nelson

DATE: 4/5/91



PLAN VIEW AT EL 560

- SECONDARY GROUT HOLE
- TERTIARY GROUT HOLE



SECTION A-A

GROUT PIPE IN L-22

APRIL 1, 1991

JAW

RFC #: 392

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: CONCRETE PAVING BETWEEN LATERALS - CONTRACTION JOINTS

SPEC REFERENCE: 3C P7.2 DRAWING REFERENCE: O-L26B-20/147

QUESTIONS: GLR CONSTRUCTORS PROPOSES TO POUR THE  
CONCRETE PAVING BETWEEN THE LATERALS IN SINGLE POURS  
WITH CONTRACTION JOINTS (AS SHOWN ON ABOVE DWG)  
CONSTRUCTED PER ATTACHED SKETCH.

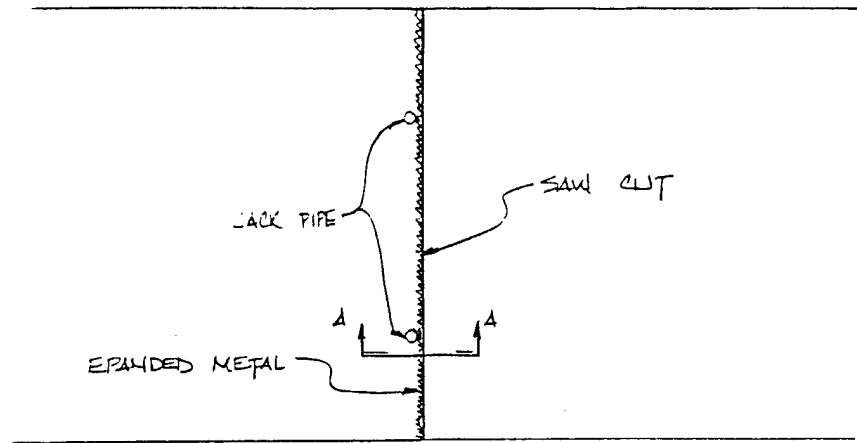
PLEASE CONFIRM.

GLR CONSTRUCTORS: DAVID L. RENICKER W DATE: JULY 29, 1991

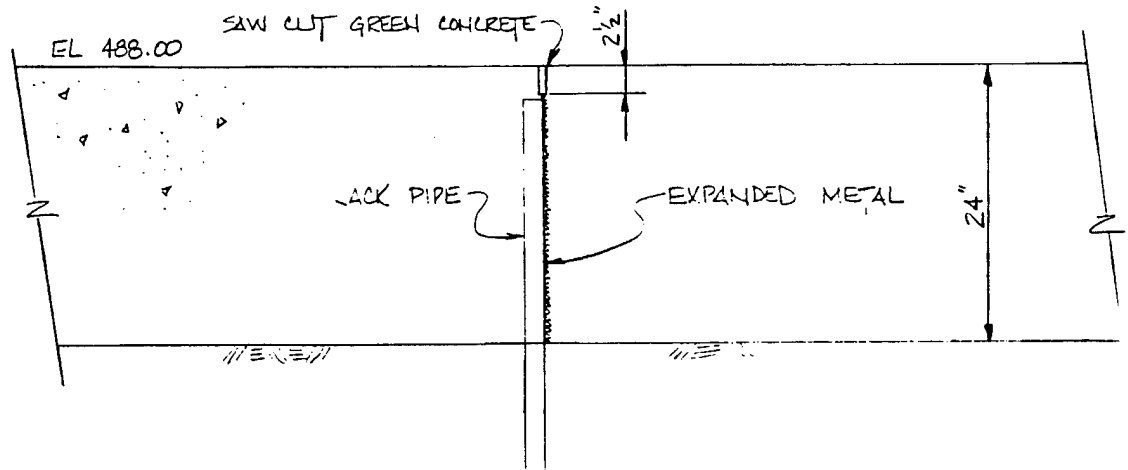
=====

RESPONSE: Your proposal is not acceptable

<sup>Const.</sup>  
RESIDENT ENGINEER: Samuel W. Hearnish DATE: 7/30/91



PLAN VIEW



SECTION A-A

RFC #: 427

8-29-91

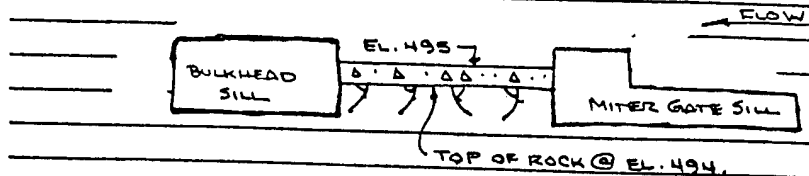
GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: BACKFILL CONCRETE

SPEC REFERENCE: CI 117

DRAWING REFERENCE: 20/135 RØ

QUESTIONS: BASED ON GEOLOGIC ROCK CONDITIONS ENCOUNTERED  
AVY. LOCK 1  
BETWEEN THE MAIN LOCK UPSTREAM MITER GATE SILL AND BULKHEAD  
SILL AND IN ACCORDANCE WITH GOVERNMENT LTR. S/N 1111  
DATED FEB. 16, 1990, SUBJECT ROCK IS TO BE REMOVED TO  
EL. 494 AND BACKFILL CONCRETE PLACED TO EL. 495



PLEASE CONFIRM

GLR CONSTRUCTORS: GEMASON 8-28-91

8-29-91  
DATE: 8-28-91

XC FB/AK/RUP/DB/

RESPONSE:

C.O.F. Confirms.

Const  
RESIDENT ENGINEER: Pat Morgan

DATE: 8/30/91

SUBJECT: BACKFILL CONCRETE

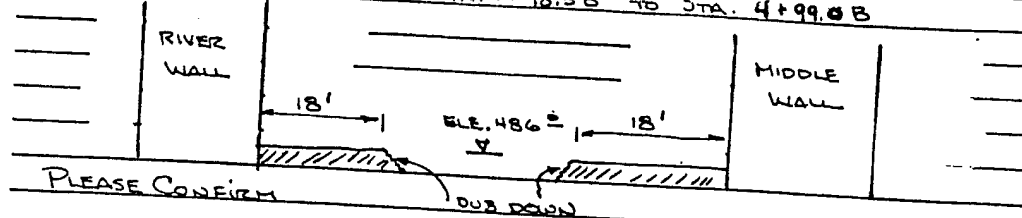
SPEC REFERENCE: CI 1117

DRAWING REFERENCE: 0-L26B-20/148

QUESTIONS: BASED ON ROCK CONDITIONS ENCOUNTERED AND IN ACCORDANCE WITH GOVERNMENT LTR. S/N 1111 DATED FEB. 16, 1990, BACKFILL CONCRETE IS TO BE PLACED AGAINST:

MAIN LOCK RIVER WALL STA. 0+78.5B TO STA. 4+88.0B

MAIN LOCK MIDDLE WALL STA. 0+78.5B TO STA. 4+99.0B



GLR CONSTRUCTORS: GEHASON g

DATE: SEPT. 24, 91

RESPONSE: CDE, Concurs! Please notify CDE if any specific areas are significantly below elevation 484.

CDE  
RESIDENT ENGINEER: PAT MORGAN

DATE: 9/30/91

RFC #: 482

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: FOUNDATION DRILLING - EXPLORATORY HOLE DRILLING

SPEC REFERENCE: 2JFP4.4

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: PER DISCUSSION BETWEEN GLR AND GOV'T GEOLOGIST,  
TWO EXPLORATORY HOLES WILL BE DRILLED AND PRESSURE  
TESTED AT LOCATIONS SHOWN ON THE ATTACHED SKETCHES.  
THESE HOLES SHALL BE CORE DRILLED. ROCK CORES SHALL  
BE RETRIEVED AND TURNED OVER TO THE GOV'T.

BASED ON GOV'T ANALYSIS OF THESE ROCK CORES, ADDITIONAL  
CORE DRILLING AND/OR FOUNDATION GRouting MAY BE REQUIRED BY  
THE GOVERNMENT.

PLEASE CONFIRM.

GLR CONSTRUCTORS:

James A. Whitworth

DATE:

Sept 30, 1991

RESPONSE:

C.O.F. CONFirms

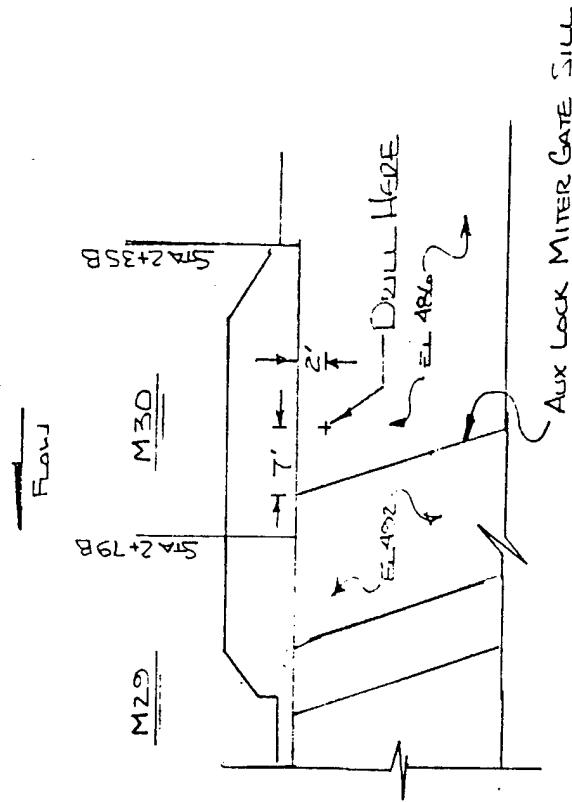
PROJECT GEOLOGIST

Larry M. Krow

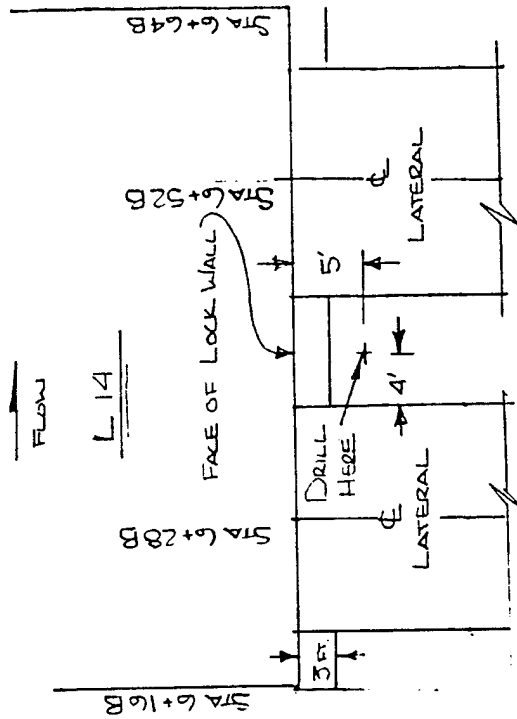
DATE:

10/1/91

NOTE: DRILL 20 LF ±  
IN VERTICAL  
DIRECTION



EXPLORATORY HOLE DRILLING  
RFC # 482  
SEP. 30, 1991  
JAW  
2 OF 2



NOTE: DRILL 20LF±  
IN VERTICAL  
DIRECTION

# EXPLORATORY HOLE DRILLING

RFC# 482  
SEP 30, 1991  
JAW  
1 OF 2

RFC #: 482 A

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: FOUNDATION DRILLING - EXPLORATORY HOLE DRILLING

SPEC REFERENCE: 2JP 4.4

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: REFERENCE GLR CONSTRUCTORS' RFC 482 (ATTACHED)  
CONCERNING THE GOV'T DIRECTED EXPLORATORY DRILLING.

GLR CONSTRUCTORS REQUEST:

1) THE GOV'T CONFIRM A 2.155"Ø ROCK CORE (3'Ø CORE BARREL)  
WILL BE ACCEPTABLE IN LIEU OF THE 4"Ø CORE LIST IN THE  
SPECIFICATIONS.

2) THE GOV'T CONFIRM THAT PHOTOGRAPHS OF THE ROCK CORES  
WILL BE REQUIRED.

3) THE GOV'T CONFIRM THAT SPECIFICATION 2J WILL GOVERN  
THE PRESSURE TESTING FOR THE EXPLORATORY HOLES.

4) THE GOV'T CONFIRM THE EXPLORATORY HOLES WILL BE REQUIRED  
TO BE BACKFILLED PER SPECIFICATION 2I.

GLR CONSTRUCTORS: James A. Whitworth

DATE: OCT 4, 1991

RESPONSE: A 2.155" ROCK CORE IS ACCEPTABLE. PHOTOGRAPHS  
WILL BE TAKEN BY C.D.E. AS TO THE SPECIFICATIONS 2J-5 4.4  
~~2J-5 4.4~~ REFERENCES EXPLORATORY DRILLING, BUT  
2J WILL BE ACCEPTABLE AS WILL 2I FOR BACKFILL

PROJECT Beckley  
RESIDENT ENGINEER: Larry M. Deason

DATE: OCT 7, 1991

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACH69-88-C-0001SUBJECT: WEEP HOLESSPEC REFERENCE: ZVP2

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: GLR CONSTRUCTORS REQUEST GOVT CONFIRMATION  
THAT NO WEEP HOLE WILL BE DRILLED TO A DEPTH GREATER  
THAN 12 FEET BELOW THE TOP OF CONCRETE, (COLLAR) AS PER  
THE REFERENCED SPECIFICATION.

GLR CONSTRUCTORS: James A. WhitworthDATE: Oct 4, 1991

RESPONSE: REFERENCE: DRAWING 20/147 NOTES "EXTEND 10'-0"  
INTO ROCK BENEATH THE PAVING FOR LOCK PAVEMENT BETWEEN  
LATERALS

REF: DRAWING 20/135 FOR LOWER AND UPPER MAIN LOCK WHICH  
STATES THE SAME AS NOTES IN DRAWING 20/147

REF: DRAWING 20/136 FOR LOWER AND UPPER AUXILIARY LOCK  
SAME AS NOTES IN 20/147

RECEIVED

OCT 07 1991

GLRC

PROJECT Geologist  
RESIDENT ENGINEER: Larry M. BrownDATE: OCT 7 1991

RFC #: 438-1

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: WEEP HOLE DRILLING

SPEC REFERENCE: ZVPZ

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: RFL 438 (ATTACHED) DIRECTS GLR CONSTRUCTORS TO DRILL WEEP HOLES 10LF INTO ROCK.

BECAUSE OF VARYING THICKNESS OF LOCK FLOOR PAVING AND BACKFILL CONCRETE AND THE GOVT REQUIREMENT TO DRILL 10LF INTO ROCK SEVERAL WEEP HOLES WILL EXCEED THE 12FT DEPTH FROM COLLAR TO BOTTOM OF HOLE ALLOWED BY THE REFERENCE SPECIFICATION.

GLR CONSTRUCTORS REQUEST THE GOVT CONFIRM THE DIRECTION TO VARY FROM THE SPECIFICATION BY EXCEEDING 12 FT DEPTH DESCRIBED ABOVE.

GLR CONSTRUCTORS:

James A. Whitworth

DATE: OCT. 11, 1991

RESPONSE: C.O.E. CONFIRMS

THERE SHALL BE NO ADDITIONAL COST TO THE GOVERNMENT

PROJECT Geologist  
RESIDENT ENGINEER:

Larry M. Brown

DATE: 10/12/91

SUBJECT: WEEP HOLE DRILLING

SPEC REFERENCE: ZV

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: GLR CONSTRUCTORS WILL PROVIDE OUR DRILLING SUBCONTRACTOR WITH STARTER HOLES IN THE EXISTING LOCK FLOOR PAVING WHEN WEEP HOLE DRILLING BEGINS. GLR CONSTRUCTORS WILL USE A PERCUSSION DRILL TO DRILL THRU THE EXISTING CONCRETE. THE DRILL SHAFT WILL BE MARKED AT A DEPTH EQUAL TO THE DEPTH OF THE CONCRETE TO BE DRILLED. THIS WILL NOTIFY DRILLER THAT HE IS APPROACHING ROCK. PERCUSSION DRILLING WILL BE TERMINATED WHEN 1) DRILL DUST COLOR CHANGES OR 2) RATE OF ADVANCE CHANGES.

GLR CONSTRUCTORS:

James A. Whitcomb DATE: Oct 8, 1991

RESPONSE:

The procedure is acceptable subject to the following.

- (1) Once the PERCUSSION drill has reached 18" of depth the hammer shall be slowed and continue at a reduced rate until rock is identified.
- (2) If this does not produce a satisfactory result then a fixed 18" of PERCUSSION drilling will be used on the remaining holes.

There shall be no additional cost to the Government.

Pat Morgan

RESIDENT ENGINEER: Pat Morgan

DATE: 10/8/91

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: FOUNDATION DRILLING & GROUTING / EXPLORATORY DRILLING

SPEC REFERENCE: 2J  
2I

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: ① IT IS THE CONTRACTOR'S UNDERSTANDING THAT ALL  
FOUNDATION DRILLING & GROUTING HAS BEEN COMPLETED TO  
THE GOVERNMENT'S SATISFACTION AND THAT ALL EQUIPMENT CAN  
BE DEMOBILIZED IN ACCORDANCE WITH PARAGRAPH 6.2.

② IT IS CONTRACTOR'S UNDERSTANDING THAT ALL  
EXPLORATORY DRILLING HAS BEEN COMPLETED TO THE GOVERNMENT'S  
SATISFACTION AND THAT ALL EQUIPMENT CAN BE DEMOBILIZED  
IN ACCORDANCE WITH PARAGRAPH 4.2 AND 6.2.

PLEASE CONFIRM ① AND ② ABOVE.

GLR CONSTRUCTORS:

James A. Whitworth

DATE: OCT 4, 1991

=====

RESPONSE: \_\_\_\_\_

C.O.E. Confirms

Project Geologist  
RESIDENT ENGINEER:

Lang M. Brown

DATE: OCT 11, 1991

RFC 1: 505

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: FOUNDATION DRILLING & GROUTING / EXPLORATORY DRILLING  
SPEC REFERENCE: ZJ ZI DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: PER OCT. 11, 1991 DISCUSSIONS BETWEEN GLR CONSTRUCTORS AND THE GOVT, THE FOLLOWING FINAL QUANTITIES WERE AGREED UPON:

BID ITEM	DESCRIPTION	QUANTITY	UNIT
31B	4" CB CORE DRILLING	11,589.76	LF
31D	SEAL CORE HOLES	11,634.96	LF
32B	DRILL 1 7/8" GROUT HOLES	10,832.50	LF
32C	CEMENT IN GROUT	2,153.26	CWT
32D	PLACE GROUT	262.69	HR
32E	PRESSURE TESTING	123.29	HR

PLEASE CONFIRM

GLR CONSTRUCTORS: James A. Whitworth DATE: OCT 14, 1991

RESPONSE: C.G.E. CONFIRMS

PROJECT Geologist  
RESIDENT ENGINEER: Larry Moore Duon DATE: October 13, 1991

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: WEEP HOLE ALIGNMENT

SPEC REFERENCE: 2V DRAWING REFERENCE: 20/136

QUESTIONS: PLACEMENT NO. 22 IN THE AUX LOCK FLOOR PAVING  
SHOULD HAVE GEA WEEPS AT 6 FT CENTER TO CENTER SPACING.  
AS IT IS CURRENTLY INSTALLED, PLACEMENT NO. 22 HAS GEA  
WEEP HOLES AT VARIOUS LOCATIONS.

PER PREVIOUS DISCUSSIONS WITH THE GOV'T, THE GEA  
MISLOCATED HOLES SHOULD BE BACKFILLED. THE GEA WEEP  
HOLES SHOULD BE LOCATED AS SHOWN ON THE CONTRACT DWG

PLEASE CONFIRM.

GLR CONSTRUCTORS: James A. Whitworth DATE: OCT 16, 1991

RESPONSE: COF. CONFIRMS: AT NO ADDITIONAL COST TO THE  
GOVERNMENT

PROJECT GEOLOGIST  
RESIDENT ENGINEER: Jerry M. Drown DATE: 10/17/91

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001SUBJECT: REMOVAL OF WHIRLEY CRANE RAIL BOLSTERSSPEC REFERENCE: 2 F

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: G.L.R. PROPOSES THE REMOVAL OF WHIRLEY CRANE RAIL BOLSTERS IN MAIN LOCK THRU THE USE OF EXPLOSIVES AS OUTLINED IN THE ATTACHED TECHNICAL PROPOSAL BY EXPLOSIVES INC.  
ADDITIONAL INFORMATION NOT SUPPLIED IN TECHNICAL PROPOSAL IS  
1) STRENGTH OF EXPLOSIVES IS GO TO DYNAMITE.  
2) ESTIMATED LENGTH OF PULL PER BLAST IS 100 FT. WHICH COVERS 30 HOLES.  
3) DRILLED HOLES ARE 2 FT. DEEP WITH APPROX. 1/2 POUND OF EXPLOSIVE.  
4) SEQUENCE OF FIRING IS NO. 1 THRU NO. 30 WITH A DELAY TIME OF 10 MILLISECOND.  
5) G.L.R. WILL TEST FIRE A SECTION 9 FT. LONG COVERING 4 HOLES TO CHECK VIBRATION AND FRAGMENTATION OF BOLSTER.  
PLEASE CONFIRM:

GLR CONSTRUCTORS: ED. MCGILVER

LC

DATE: OCT. 30, 1991

=====

RESPONSE: Your proposed procedure is Acceptable Subject to the following.

- (1) You are responsible for performance and any possible damage to permanent work.
- (2) An additional test blast is done on a fifty (50) foot section to correlate with the Nine (9) foot test.
- (3) Acceptable Quality Control plan which includes the location and frequency of measurements.
- (4) Acceptable Job Hazard Analysis is submitted
- (5) NO Additional test to Cont.

RESIDENT ENGINEER: PAT MORGANDATE: 11/12/91

## TECHNICAL PROPOSAL:

ETI/Explosives, Inc. propose to furnish the explosives and blaster to remove the gantry rail footers. Drilling will be performed by GLR Constructors.

Based on desired fragmentation size and the depth of the footer, ETI will design and layout the the drill pattern for GLR. To insure good explosive distribution and blast control, drill hole size should be between 1-3/8 to 1-3/4 inches in diameter. Water Gel explosive 1-1/4 x 8 is proposed. This product is selected because of consistency and water resistance which will insure both safety and control. Initiation will be with electric detonators (unless otherwise required by GLR or the Corps of Engineers). In conjunction with a sequential timer, detonation delay can be adjusted to suit the pattern design and vibration restraints. Stemming of the blast holes will be done with clay. This reduces potential shrapnel, if the blast hole should rifle due to undetected confinement.

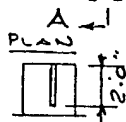
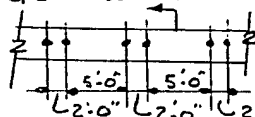
Based on general blast criteria and the confinement nature of the footer, the vibration limitation of 4 inches per second proposed by the Corps of Engineers, should not present a problem. Using the following vibration blast formula extracted from the "DuPont Blasters' Handbook", page 426, expected vibration levels are well withing the excepted limits.

$$PPV=160(Dist/Wt^{1/2})^{-1.6}$$

Using a distance of 20 feet and a charge weight of 1 pound, the expected peak particle velocity is 1.33 inches per second. (Note: A 1-1/4 x 8 catridge is about 1/2 pound of explosive) The use of the sequential timer can also keep blast frequencies high, further reducing the risk of potentential vibration damage. A seismograph will be used to insure compliance with the Corps of Engineers limitations.

For estimating purposes, assuming total fragmentation of the footer, use a centerline drill pattern on 2 foot centers to a depth withing 3 inches of bottom of the footer. Wider spacings can be used if fragmentation can be courser or footer is to be removed in block sections. Explosives consumption is 1/2 lb per three feet drill hole and one detonator per 1/2 pound of explosive. Estimated time to load is one day.

GLR WILL DRILL HOLES TO A PATTERN AS SHOWN



WHIRLEY BOLSTER WILL BE  
REMOVED IN 5.0' SECTIONS TO  
AN ELEVATION OF 488.00'

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: WEEP HOLES

SPEC REFERENCE: 2V

DRAWING REFERENCE: 20/147  
20/135 & 136

QUESTIONS: GOVERNMENT HAS REQUESTED THAT CONTRACTOR  
FILL ALL WEEP HOLES, FROM BOTTOM OF HOLE TO TOP OF  
CONCRETE, WITH 3/8"  $\phi$  TOP SIZE, UNIFORMLY GRADED,  
RIVER RUN PEA GRAVEL.

PLEASE CONFIRM.

REQUESTED RESPONSE DATE: Nov 22, 1991

GLR CONSTRUCTORS: G.E. MASON

9 DATE: Nov. 19, 1991

xc JW, AK  
=====

RESPONSE: C.E. CONCURS.

Carl  
RESIDENT ENGINEER: PAT MORGAN

DATE: 11/19/91

RFC 1: 581

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-8881

SUBJECT: FINAL BILLING QUANTITIES - WEEP HOLES

SPEC REFERENCE: 2V

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: PER DEC 2, 1991 DISCUSSION WITH THE GOV'T,  
GLR CONSTRUCTORS CONSIDERS THE FOLLOWING TO BE THE  
FINAL QUANTITY:

<u>QTY</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
<u>174</u>	<u>WEEP HOLES</u>	<u>LF</u>

PLEASE CONFIRM

REQUESTED RESPONSE DATE: DEC 6, 1991

GLR CONSTRUCTORS:

James A. Whitworth, Jr.

DATE: DEC 2, 1991

RESPONSE:

C.O.E. Concurs.

Civil

RESIDENT ENGINEER:

Des Raj Singh 12/3/91  
Dennis E. Hughes

DATE: 12/3/91

Gallipolis Locks Replacement  
 Bid Item 174: Weep Holes  
 =====

Date	Drilling (lf)
27-Nov-91	0
26-Nov-91	0
25-Nov-91	140
22-Nov-91	0
21-Nov-91	430
20-Nov-91	360
19-Nov-91	370
18-Nov-91	300
15-Nov-91	290
14-Nov-91	260
13-Nov-91	280
12-Nov-91	290
11-Nov-91	220
08-Nov-91	0
07-Nov-91	0
06-Nov-91	0
05-Nov-91	100
04-Nov-91	160
01-Nov-91	270
31-Oct-91	420
30-Oct-91	480
29-Oct-91	130
28-Oct-91	420
25-Oct-91	200
24-Oct-91	490
23-Oct-91	490
22-Oct-91	100
21-Oct-91	240
18-Oct-91	270
17-Oct-91	270
16-Oct-91	310
15-Oct-91	190
14-Oct-91	50
Total	7530

605

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001SUBJECT: FINAL QUANTITIES - H-PLING / BID ITEMS 27 THRU 30  
SPEC REFERENCE: 2H DRAWING REFERENCE: \_\_\_\_\_QUESTIONS: Bid Item 27 - 3755.15 LF  
Bid Item 28 - 4239.46 LF  
Bid Item 29 - 835.75 LF  
Bid Item 30 - 129 ERECTGLR CONSTRUCTORS: Mike Gary JohnsonDATE: 12/26/91RESPONSE: The Government confirms the following final quantities.Bid Item 27 - 3762.2 LF.  
Bid Item 28 - 4241.8 LF  
Bid Item 29 - ~~835~~ 842.3 LF  
Bid Item 30 - 130 Ea.Civil  
RESIDENT ENGINEER: Dennis E. HufferDes Raj Singh 1/10/92DATE: 1/10/92

REC #: 618

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: SLURRY TRENCH CUTOFF WALLS - FINAL BID QTY.

SPEC REFERENCE: 2E

DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: FINAL BID ITEM QUANTITY AS AGREED BETWEEN  
GLR CONSTRUCTORS/ICOS AND THE GOVERNMENT

BID ITEM 10: 499,449.<sup>00</sup> SF

PLEASE CONFIRM.

GLR CONSTRUCTORS: GEMASON

DATE: JAN. 17, 1992

RESPONSE: COE Confirms.

Civil

RESIDENT ENGINEER: Dennis E. Hughes

DATE: 1/21/92

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: ANCHOR BARS - PRESTRESSED - FINAL BIO QTY  
SPEC REFERENCE: 20 DRAWING REFERENCE: 20/138 REV 0

QUESTIONS: FINAL BIO ITEM QUANTITY FOR:

B.I. 165 ANCHOR BARS - PRESTRESSED = 5500 LF.

GLR CONSTRUCTORS: GEMASON g DATE: JAN. 17, 92

RESPONSE: COE Confirms.

Civil  
RESIDENT ENGINEER: Jessie E. Hughes DATE: 1/21/92  
Gordon F. Hand

RFC #: 622

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: PRELIMINARY CLEANUP

SPEC REFERENCE: 2F DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: FINAL BID ITEM QUANTITY FOR:

BID ITEM 16: 90,686.3 S.Y.

GLR CONSTRUCTORS: Heidi M Olanin DATE: 1-20-92

=====

RESPONSE: COE Confirms.

Civil  
RESIDENT ENGINEER: Dennis E Hughes DATE: 1/21/93  
Anthony Land

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001SUBJECT: QUARRY RUN FILLSPEC REFERENCE: MOD P00135 DRAWING REFERENCE: N/A

QUESTIONS: PAGE 2 PARAGRAPH 3 REQUIRES LOW AREAS TO BE  
FILLED W/ QUARRY RUN STONE. "FILTER CLOTH AND STONE SLOPE  
PROTECTION SHALL THEN BE PLACED PER THE CONTRACT DRAWING"  
CONTRACTOR UNDERSTANDS THAT FILTER CLOTH SHALL ONLY  
BE PLACED OVER EXCAVATED SURFACES & NOT OVER PREVIOUSLY  
PLACED QUARRY RUN STONE.

GLR CONSTRUCTORS: GEMASON g DATE: JAN. 23, 92

=====

RESPONSE: C.O.E. CONCURS.

RESIDENT ENGINEER:

Pat McGinnis  
James D. Land

DATE:

1/24/92



DEPARTMENT OF THE ARMY  
HUNTINGTON DISTRICT, CORPS OF ENGINEERS  
502 EIGHTH STREET  
HUNTINGTON, WEST VIRGINIA 25701-2070

REPLY TO  
ATTENTION OF:

February 16, 1990 S/N 1111

Construction Division  
Gallipolis Resident Office

SUBJECT: Rock Overbreak, Construction of the New Gallipolis Locks,  
Contract No. DACW69-88-C-0001

G.L.R. Constructors  
P.O. Box "T"  
Point Pleasant, West Virginia 25550

Gentlemen:

The following procedures shall be utilized in areas where the vertical rock faces have overbroke.

Neat line shall be formed as soon as practical in areas of overbreak faces for monoliths. No concrete shall be placed more than one foot outside neat line as a continuous part of the designed monolith (i.e. areas greater than 1' must be formed).

The voids created by forming of neat line in areas of overbreak do not need backfill except as follows:

- Overbreak areas for monoliths L-16 thru L-25 (Lock side) must be cleaned and backfilled with concrete.
- Overbreak areas for monoliths M-29 thru M-37 (Main Lock Side) must be cleaned and backfilled with concrete.
- Overbreak areas for R-28 thru R-37, R-52 thru R-64 and R-78 thru R-92 on the lock side shall be cleaned and filled with concrete.
- All sills on both sides and all outside bends in conduits shall be cleaned and backfilled with concrete.
- All areas within the chambers where overbreak has occurred and no concrete is replaced shall be graded to prevent safety hazards during dewatered conditions.

G. L. R.


FEB 20 1990

RECEIVED

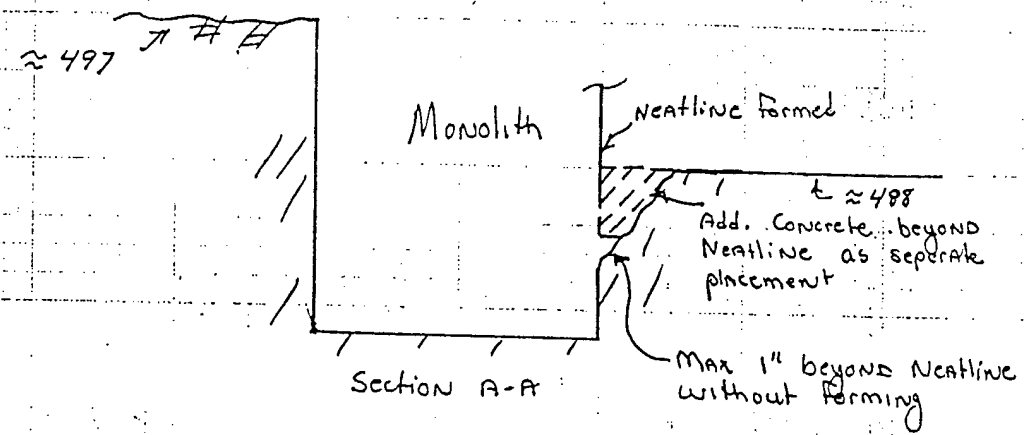
ORIGINAL

Should you have any questions and/or concerns you may contact this office.

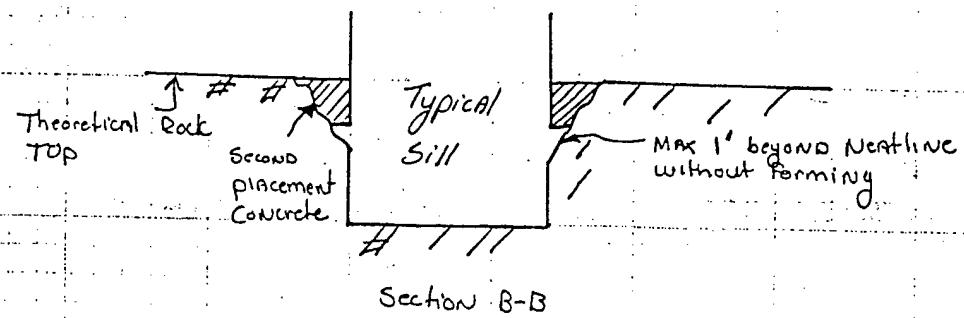
Sincerely,

  
Ronald C. Harris  
Administrative Contracting  
Officer

Typical section with overbreak and  
Concrete backfill on one side

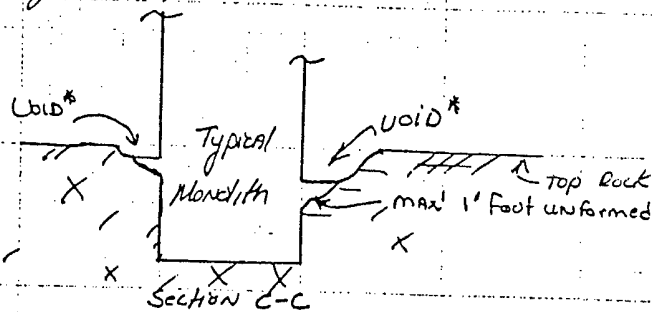


Typical section with overbreak and  
Concrete backfill on both sides (sills)



Form 127

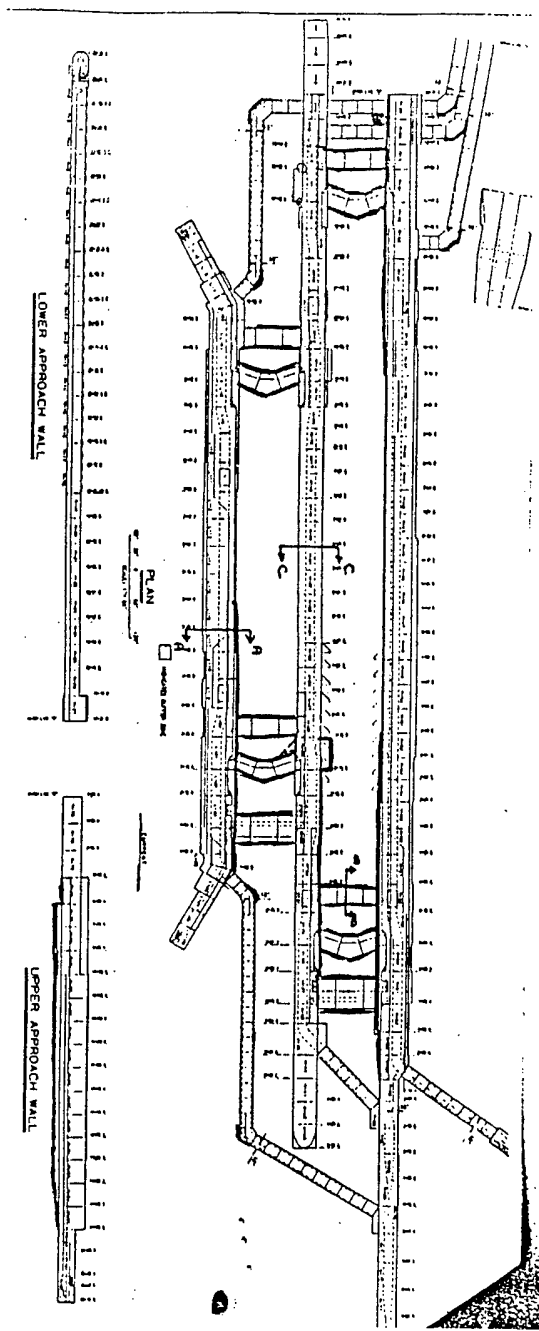
Typical Section with overbreak and NO backfill



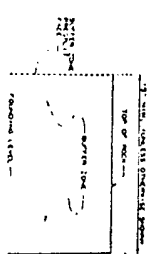
- \* Areas inside Chamber need graded to provide safe access during dewatered conditions.
- Areas outside Chamber don't need any correction.

SEE 9

S/C 1111



— Areas to receive  
concrete backfill



NOTES

1. The structure is to be built on the existing rock.
2. The structure is to be built on the existing rock.
3. The structure is to be built on the existing rock.
4. The structure is to be built on the existing rock.
5. The structure is to be built on the existing rock.
6. The structure is to be built on the existing rock.
7. The structure is to be built on the existing rock.
8. The structure is to be built on the existing rock.
9. The structure is to be built on the existing rock.
10. The structure is to be built on the existing rock.

Project Name	GALLIPOLI LOCKS
Location	LOCK 5 IN CANAL
Rock Excavation	
Notes	
Drawn By	
Checked By	
Approved By	
Date	

PATTERSON/mw/5497

August 14, 1991

CEORH-CD-A

SUBJECT: Slurry Trench Sand Content, Construction of the New  
Gallipolis Locks, Contract No. DACW69-88-C-0001

G L R Constructors  
P. O. Box "T"  
Point Pleasant, WV 25550

Gentlemen:

Reference is made to your serial letter number 91-215  
requesting equitable adjustment arising out of ICOS Corporation  
of America's claim for delay in construction of the slurry  
trench.

This office has reviewed the data provided. However, the  
only data shown are for the period between April 4, 1988 and  
June 26, 1988. In order that we can make a more thorough review,  
please provide this office the data relating to delays, if any,  
encountered before April 4, 1988 and after June 26, 1988.

Sincerely,

Gordon M. Butler, Jr.  
Authorized Representative of  
the Contracting Officer

CF:  
CEORH-CD  
CEORH-CD-A  
CEORH-CD-GAL  
CEORH-CT  
CEORH-DL

PATTERSON *DYP* CD-A  
SHELDON *PS* CD-A  
BUTLER *HB* CD

DATE AUG. 8, 1991

FROM GEMASON

TO FILE

REF FOUNDATION CLEAN UP

CELLS CB-C16 & C19

GOVERNMENT CRITERIA FOR CLEAN-UP FOR CONCRETE  
PLACEMENT IS SHOVEL CLEAN NO PICKING NO BAZING.

g

Buzz, Dale, etc. 8/9/91

COF. Council

→  
T H

2F / FB/DB/PAT MORGAN/RF

DATE AUG. 8, 1991

FROM GEMASON

TO FILE CI 164 MAT'L SHORTAGE

REF: TELECON FROM PAT MORGAN

EFFECTIVE IMMEDIATELY, WHERE GLR WAS REMOVED  
IMPERVIOUS MATERIAL FROM D/S DIKE, THE DIKE SHOULD  
BE RESTORED NOT TO ORIGINAL X-SECTION <sup>TO</sup> BUT THE  
REVISED X-SECTION OF MOD P109.

g

Buzz, Dale, etc...

8/9/91

G.O.E. CONCURS,

Pat

AK → CI 164 / ~~P. MORGAN~~ / LB / JH / BO /

GLR CONSTRUCTORS  
CONTRACT CLARIFICATION MEMO  
CONTRACT #DACW69-88-C-0001

SUBJECT: FINAL FOUNDATION CLEANUP AND PREPARATION  
SPEC REFERENCE: 2F DRAWING REFERENCE: \_\_\_\_\_

QUESTIONS: FINAL BID ITEM QUANTITY FOR:

BID ITEM NO. 17 FINAL CLEANUP = 54,012.2 SY

GLR CONSTRUCTORS: HMO J E Hason DATE: 1-29-92

=====

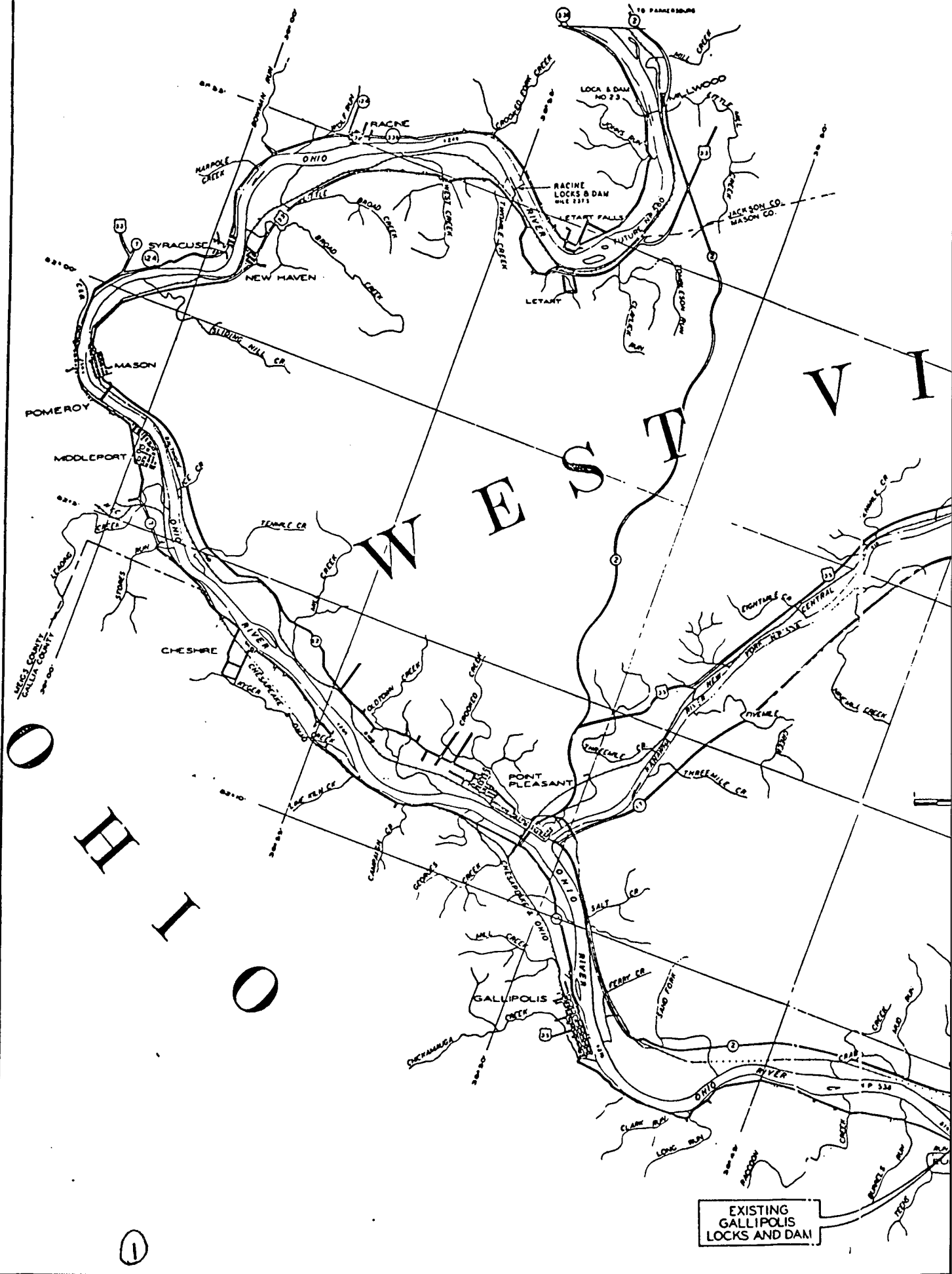
RESPONSE: COE Confirms

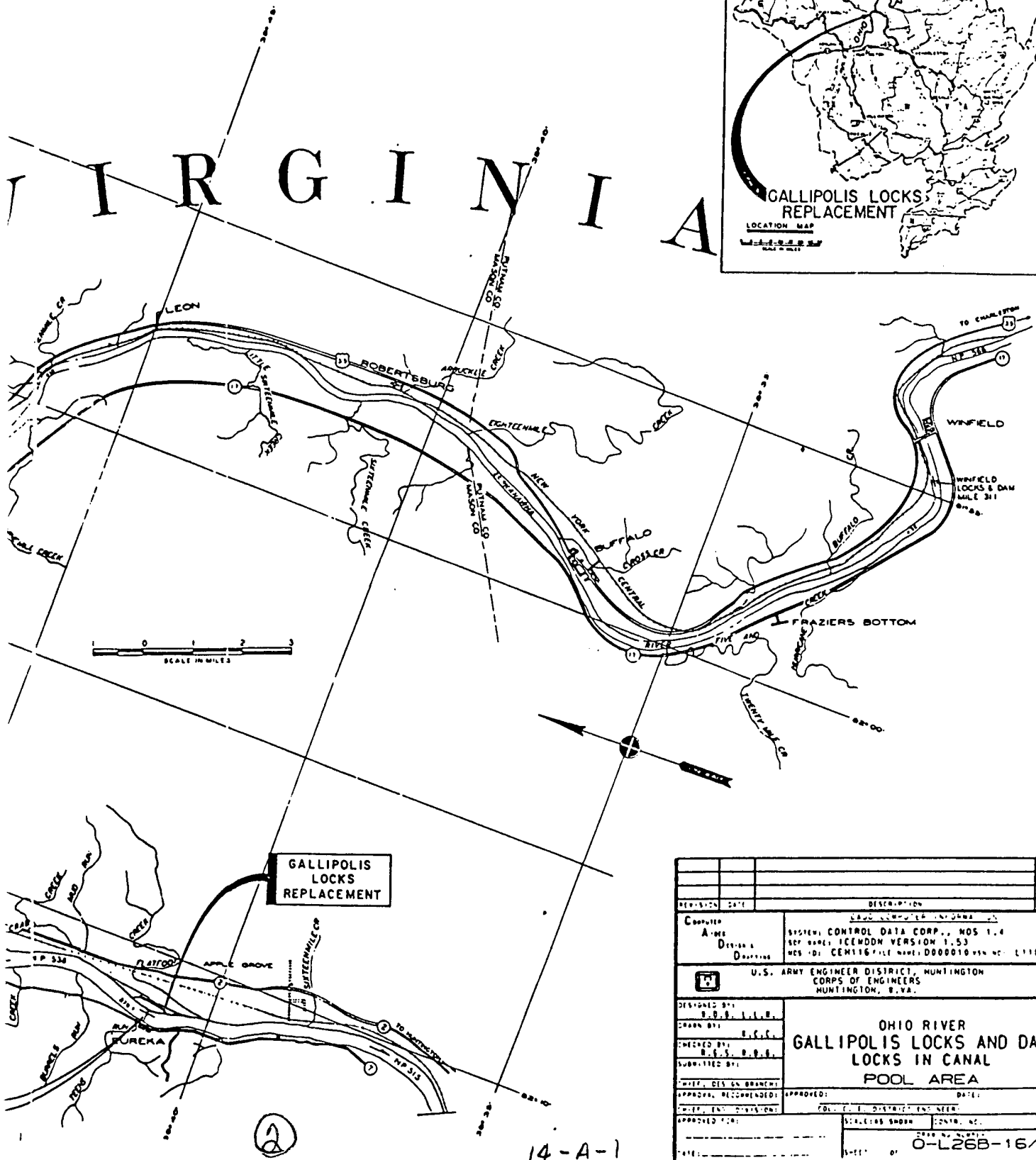
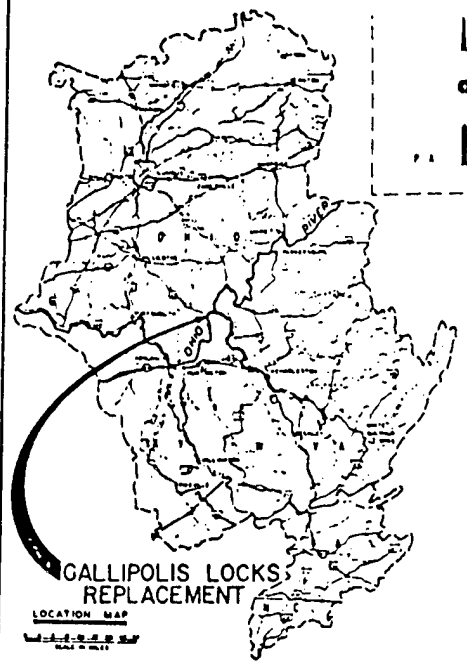
Del Raj Segal 2/6/92  
RESIDENT ENGINEER: Dennis E. Hays DATE: 2/6/92  
Civil

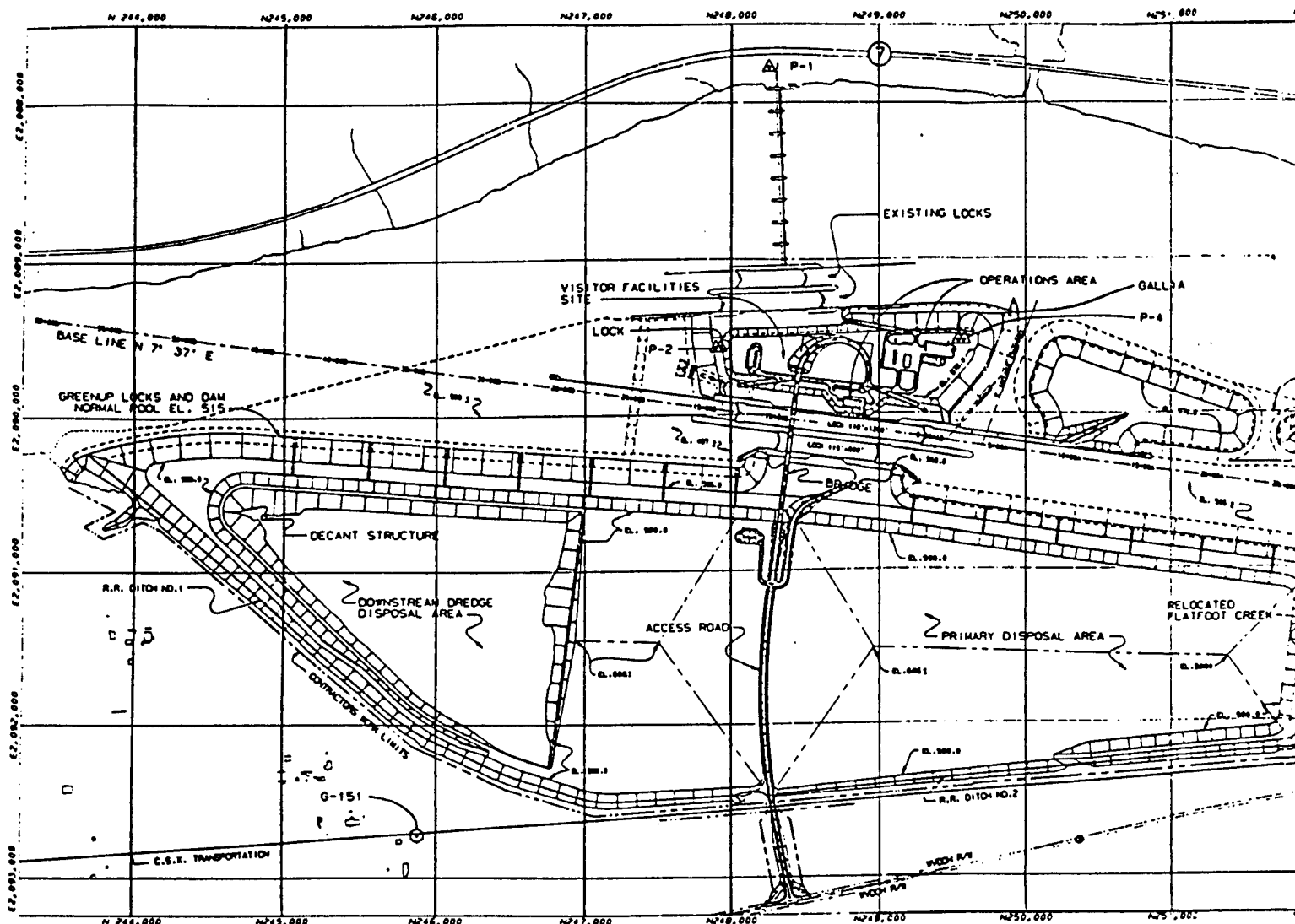
## Exhibits

### Section XIV

SECTION	TITLE	PAGE
(A)	Vicinity Map	14-A-1
(B)	Site Map	14-B-1
(C)	Generalized Regional Geology	14-C-1
(D)	Geologic Column	14-D-1
(E)	Physiographic Provinces	14-E-1
(F)	Structural Geology	14-F-1
(G)	Location Plan for Borings	14-G-1
(G)	Location Plan for Borings ( Continued )	14-G-2
(H)	Exploratory Drilling and Boring Location Plan	14-H-1
(I)	Rock Excavation, Pre-split	14-I-1
(J)	Rock Excavation, Buffer Zone	14-J-1
(K)	Foundation Grouting	14-K-1
(L)	Weep Holes, Main Lock Floor Pavement	14-L-1
(M)	Weep Holes, Auxilary Lock Floor Pavement	14-M-1
(N)	Weep Holes, Auxilary Lock Laterals	14-N-1



[illegible]



# LEGEND

PLAN 1

SCALE: 1"=400'

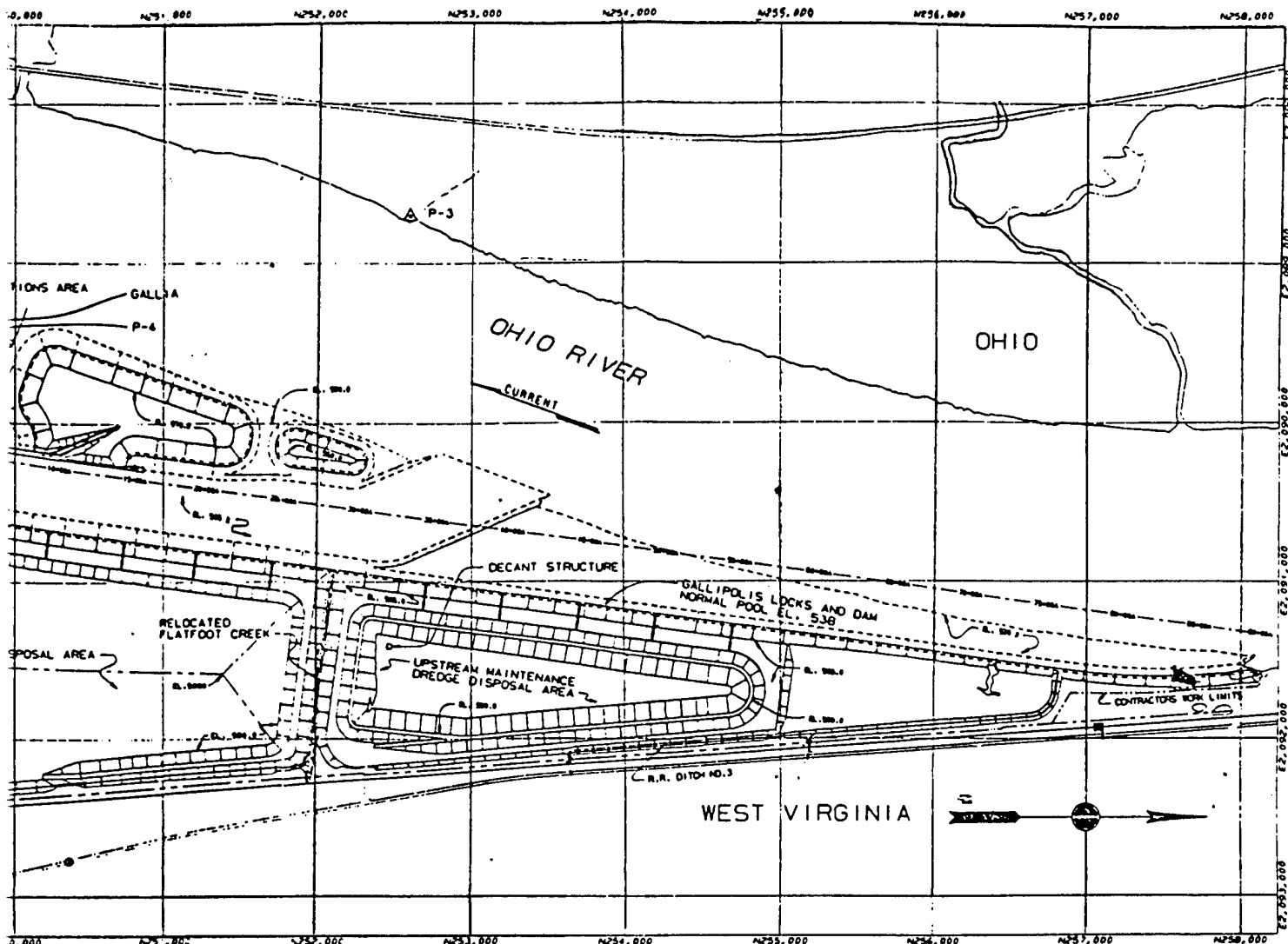
POINT	HORIZONTAL CONTROL		VERTICAL CONTROL
	N	E	O.R.D.
GALLIA	249,535.180	2,089,526.830	572.09
LOCK	247,929.100	2,089,567.600	571.21
P-1	248,260.860	2,087,777.173	---
P-2	247,894.177	2,089,568.487	---
P-3	252,591.167	2,088,701.418	---
P-4	249,579.938	2,089,525.700	---
G-151	245,875.130	2,092,716.550	581.14

## GENERAL CONTROL NOTES

- HORIZONTAL DATUM BASED ON OHIO SOUTH ZONE S.P.C.S.
- VERTICAL DATUM BASED ON 1911-12 ADJUSTMENT (OHIO RIVER).

- DRAINAGE DITCH
- DISPOSAL DIKE
- STONE SLOPE PROTECTION
- CONTRACTOR WORK LIMITS
- C.S.X. TRANSPORTATION
- MANHOLE ALIGNMENT
- CATCH BASIN ALIGNMENT
- FENCE ALIGNMENT

# ring Produces Better Environment



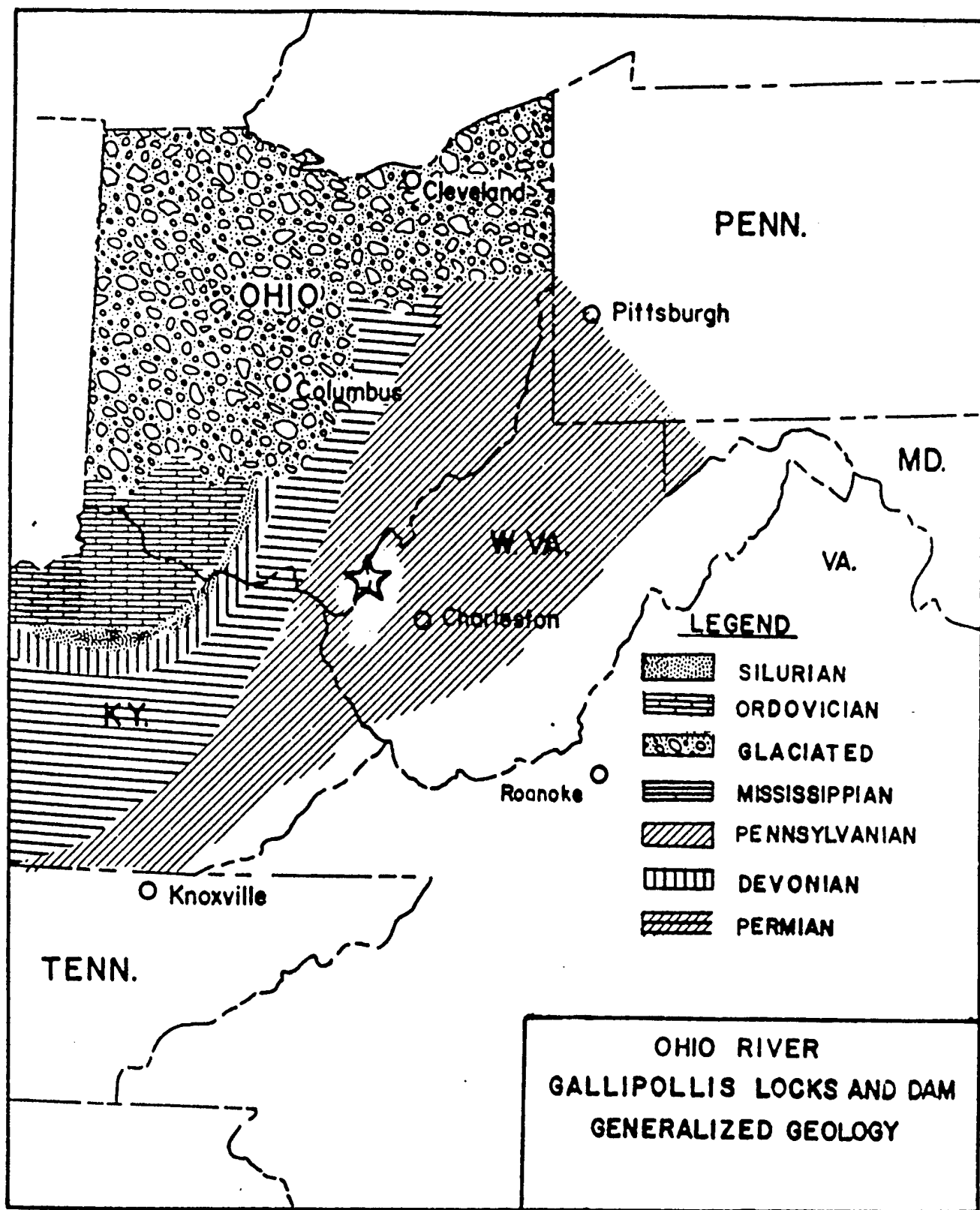
## NOTES

1. CURVE DATA SHOWN IS BASED ON ARC DEFINITION.
2. WORKING AREA AVAILABLE TO THE CONTRACTOR IS INDICATED BY THE CONTRACTOR'S WORK LIMITS (C.W.L.).
3. ALL UTILITIES WITHIN THE CONTRACTOR'S WORK LIMITS SHALL REMAIN IN SERVICE AT ALL TIMES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE RELOCATION OF ALL THE UTILITIES WITHIN HIS WORK LIMIT.
4. THE LOCATIONS OF THE UNDERGROUND UTILITIES SHOWN ON THE PLANS HAVE BEEN OBTAINED FROM DILIGENT FIELD CHECKS AND SEARCHES OF AVAILABLE RECORDS. IT IS BELIEVED THAT THEY ARE ESSENTIALLY CORRECT; HOWEVER, ALL LOCATIONS THAT AFFECT THE WORK SHALL BE CONFIRMED BEFORE THE AFFECTED WORK ITEM IS INITIATED. IF ACTUAL FIELD CONDITIONS OF UTILITIES DO NOT AGREE WITH THE DATA INDICATED ON THE DRAWINGS, THE CONTRACTING OFFICER SHALL BE NOTIFIED IMMEDIATELY.
5. TRAFFIC SHALL BE MAINTAINED WITHIN THE LIMITS OF THE PROJECT DURING CONSTRUCTION. THE CONTRACTOR SHALL FURTHER ARRANGE HIS OPERATIONS SO AS TO KEEP TRAFFIC INCONVENIENCE TO A MINIMUM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NECESSARY SIGNS, LIGHTS, AND BARRICADES WITHIN THE CONSTRUCTION LIMITS AS PROVIDED IN THE SPECIFICATIONS.
6. ALL ABANDONED STRUCTURES WITHIN THE CONTRACTOR'S WORK LIMITS SHALL BE REMOVED UNLESS OTHERWISE NOTED. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL STRUCTURES.
7. THE CONTRACTOR SHALL REPLACE, AT HIS OWN EXPENSE, ANY ITEM NOT SPECIFICALLY INDICATED FOR REMOVAL THAT IS DAMAGED OR DESTROYED BY HIS OPERATIONS.
8. TRAFFIC SHALL BE MAINTAINED AT ALL TIMES ON C.S.X. TRANSPORTATION RAILWAY.

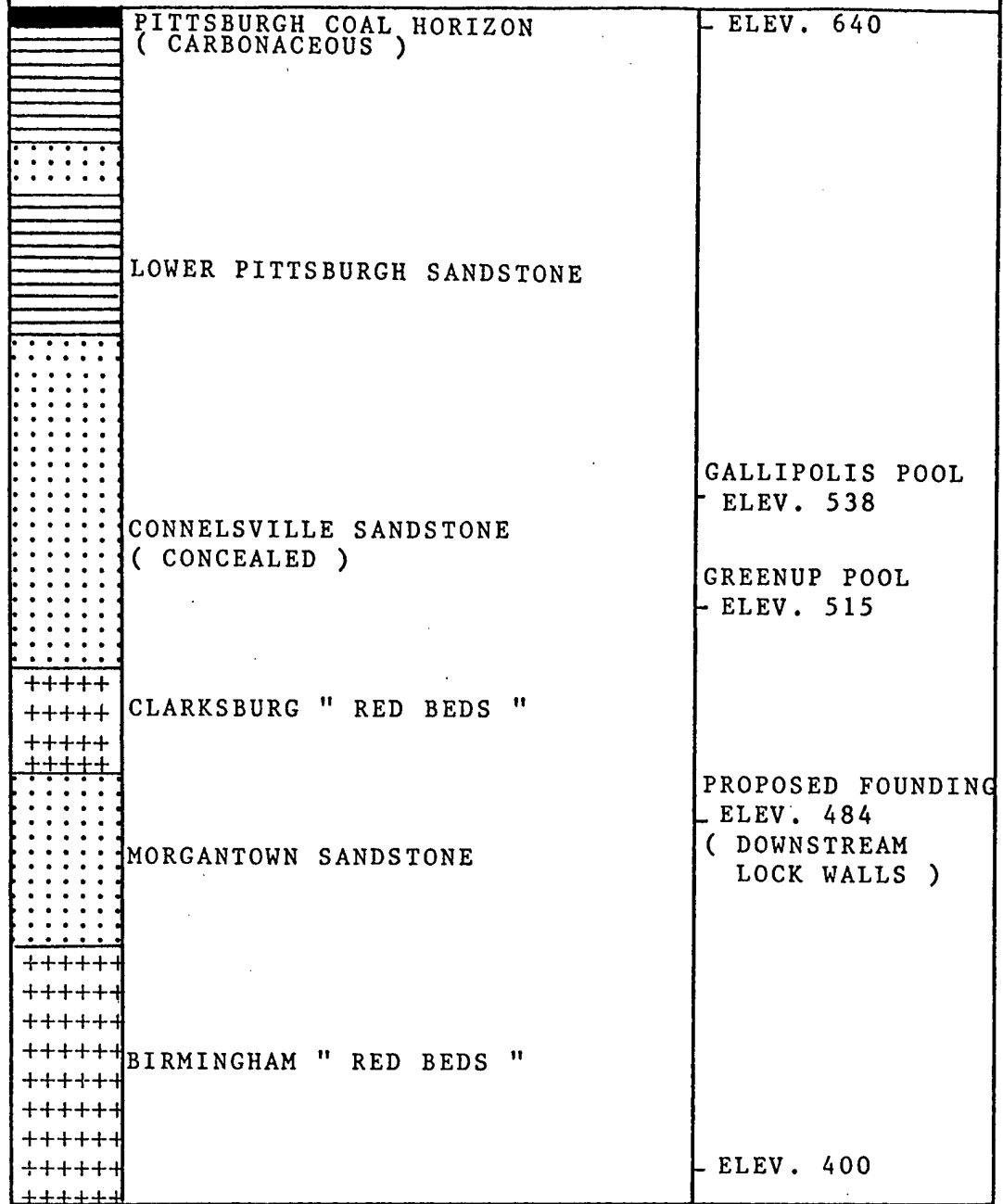
10-25-87 REVISED IN ACCORDANCE WITH AMENDMENT NO. 0002 N.O.B.	
COMPUTER AIMS DESIGN DRAFTER	SYSTEM: CONTROL DATA CORP., NOS 1, 4 SOFTWARE: ICEMDDH VERSION 1.53 NOS 101: CEM111 FILE NAME: 1600162 YSH NO: A09950
U.S. ARMY ENGINEER DISTRICT, HUNTINGTON CORPS OF ENGINEERS HUNTINGTON, W. VA.	
OHIO RIVER GALLIPOLIS LOCKS AND DAM LOCKS IN CANAL OVERALL SITE PLAN	
DESIGNED BY: P.G.S. L.L.W. P.D.B. DRAWN BY: P.G.S. CHECKED BY: P.G.S. L.L.W. P.D.B. SUBMITTED BY:	DATE: APPROVED:
CHIEF, DESIGN BRANCH: APPROVAL RECOMMENDED: CHIEF, ENG. DIVISION: APPROVED FOR:	COL. C. E. DISTRICT ENGINEER SCALE: AS SHOWN SHEET NO. OF 0-L26B-16/2

2

14-B-2

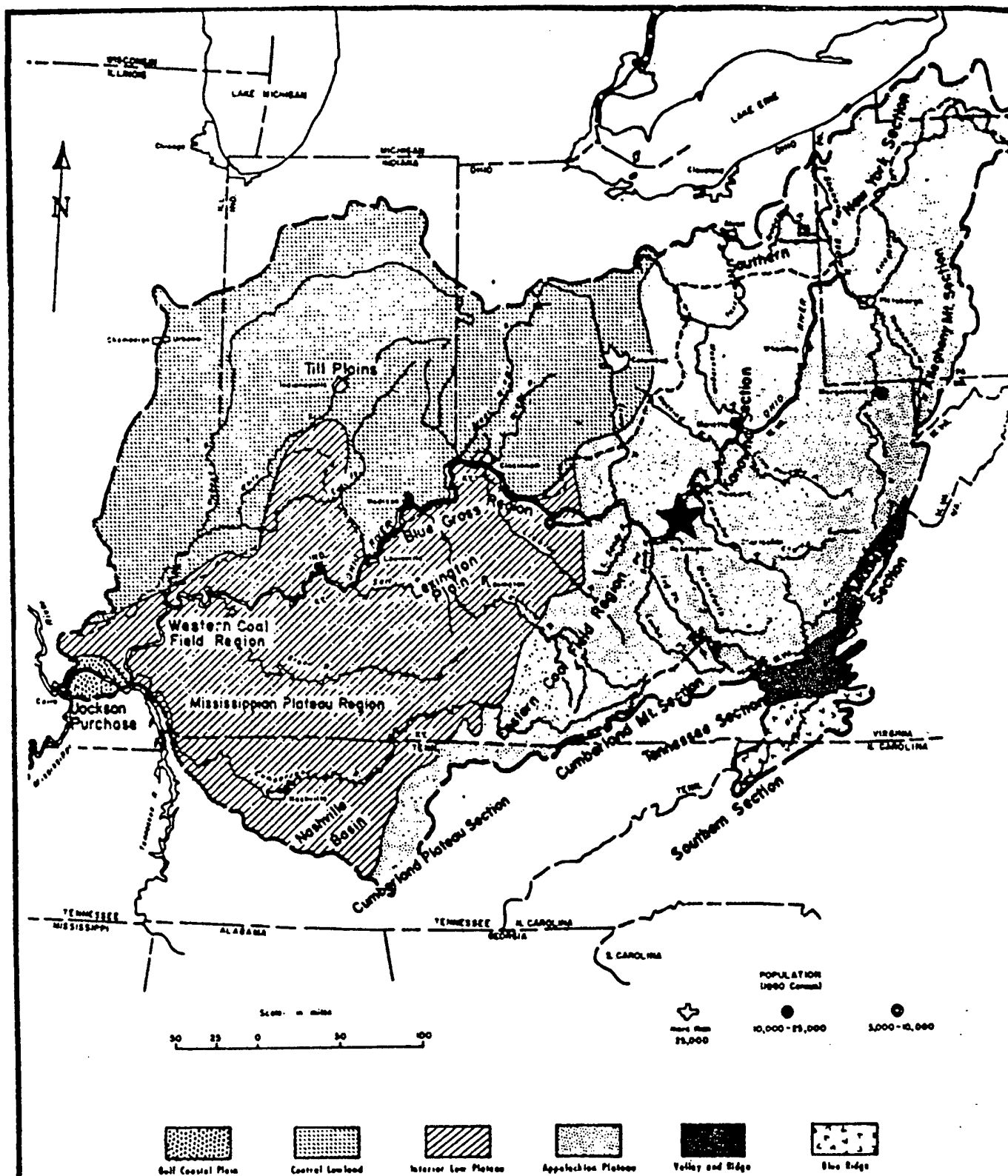


# GALLIPOLIS LOCK AND DAM



GENERALIZED GEOLOGIC COLUMN

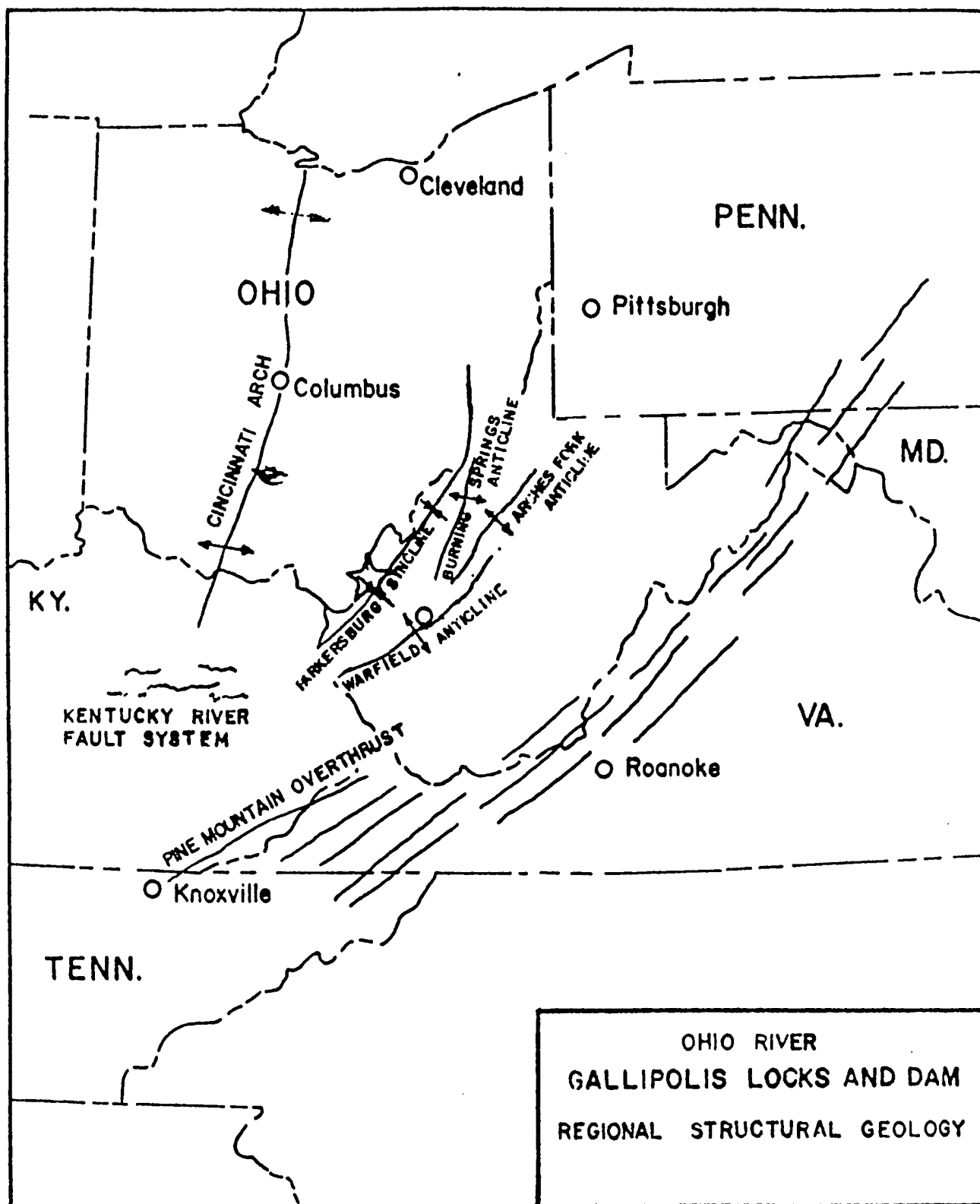
14-D-1



SOURCE:  
U.S. DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Southern limit of Continental Glaciation

## OHIO RIVER BASIN PHYSIOGRAPHIC PROVINCES



OHIO  
(GALLIA COUNTY)

OHIO

12,089,000

NORMAL POOL GREENUP  
LOCKS AND DAM EL. 515.0  
60+00.78 BASE LINE, E LOCK,  
N 7° 37' E

30+00.8  
MLE + 280

44+50.8

40+00.8

APPROACH CHANNEL

STONE SLOPE  
PROTECTION

EXCAVATION LIMITS  
EL. 500.2

EXISTING SAILING LINE (APPROX. LOCATION)

30+00.8

C-217

C-214

C-218

C-219

NORMAL POOL GREENUP  
LOCKS AND DAM EL. 515.0

C-223

EL. 565.0

C-228

C-239

C-237

C-227

C-228

C-238

SECONDARY DISPOSAL FOR  
CHEMICAL TREATMENT OF  
CONSTRUCTION DREDGING

C-240

PRIMARY DISPOSAL AREA  
AND MAINTENANCE DREDGING  
DISPOSAL AREA

PROJECT BOUNDARY LINE

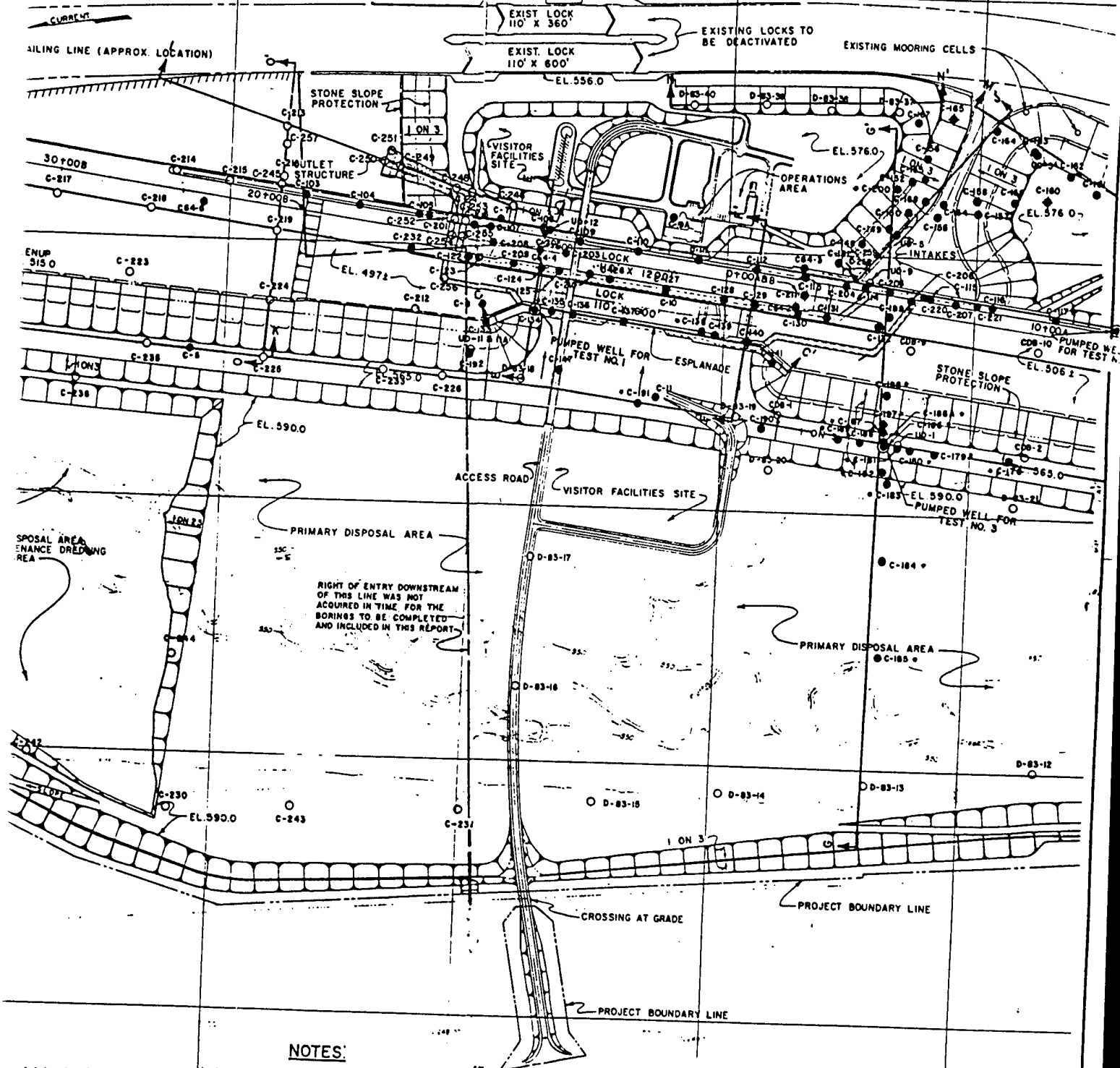
BALTIMORE AND OHIO RAILROAD  
(CHESIE SYSTEM)

W. VA.  
(MASON COUNTY)

2

①

RIVER



NOTES:

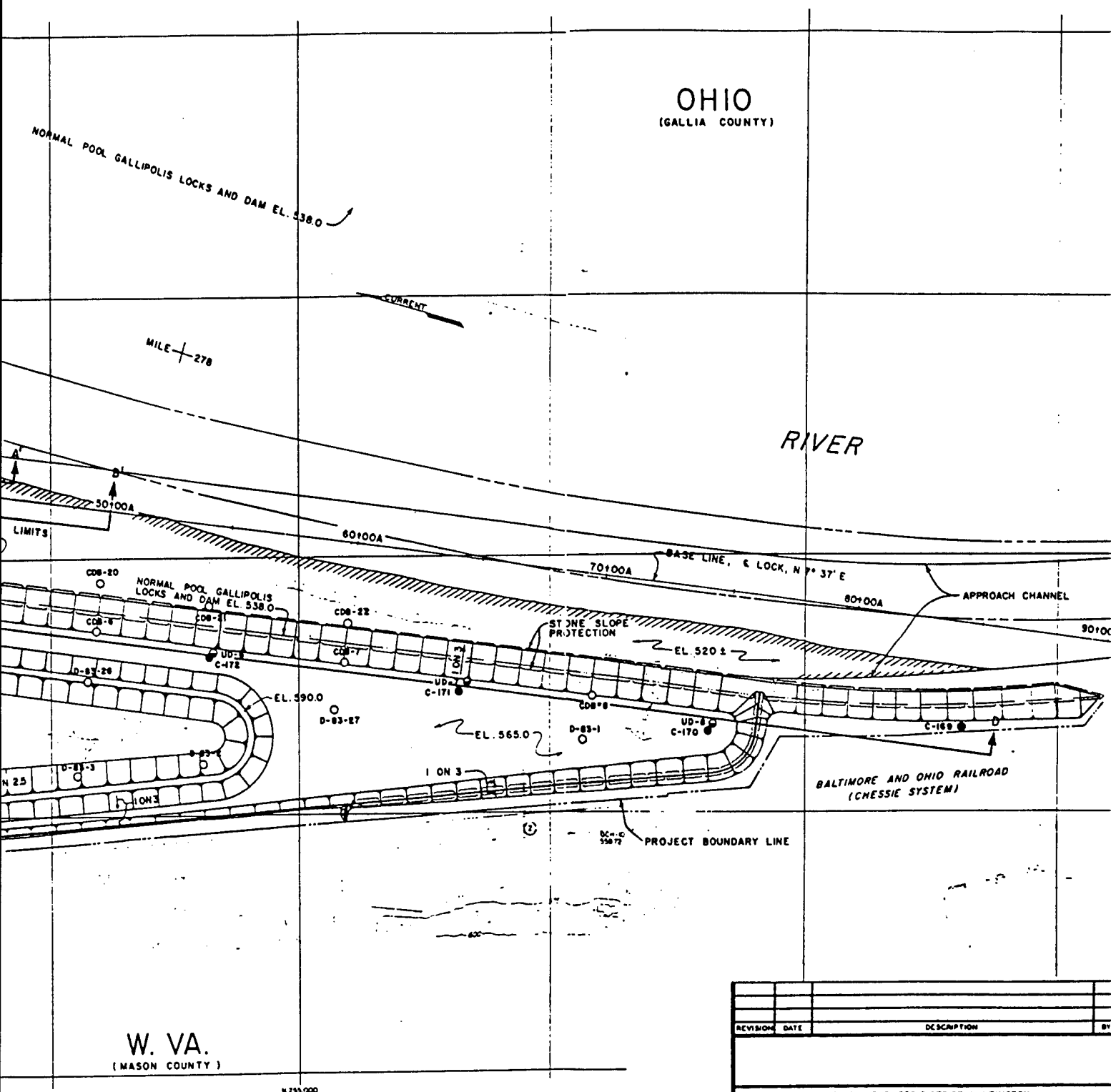
- 1- SECONDARY DISPOSAL AREA DIKE WILL BE BREACHED OR REMOVED WHEN CONSTRUCTION DREDGING IS COMPLETED.
- 2- HOLES LOCATED WITH AN X HAVE NOT<sup>3</sup> BEEN TESTED AT ORD AND ARE NOT INCLUDED IN GRAPHIC LOGS OF EXHIBIT NO 5
- 3- SEE EXHIBIT 3, GEOLOGIC LEGEND FOR SYMBOL DESIGNATION OF EXPLORATION MAES.
- 4- HOLE NUMBERS FOLLOWED BY AN X INDICATE PUMP TEST OBSERVATION HOLES.

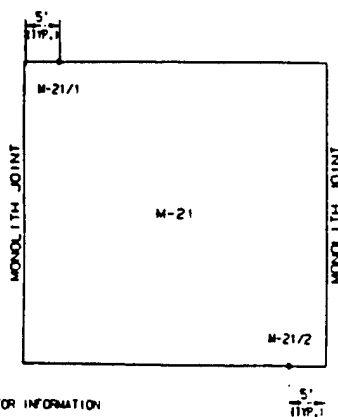
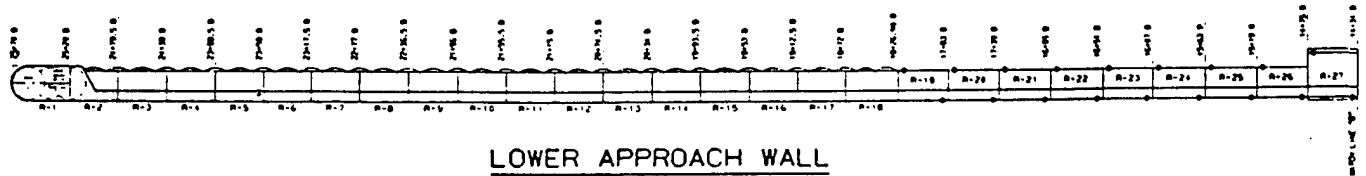
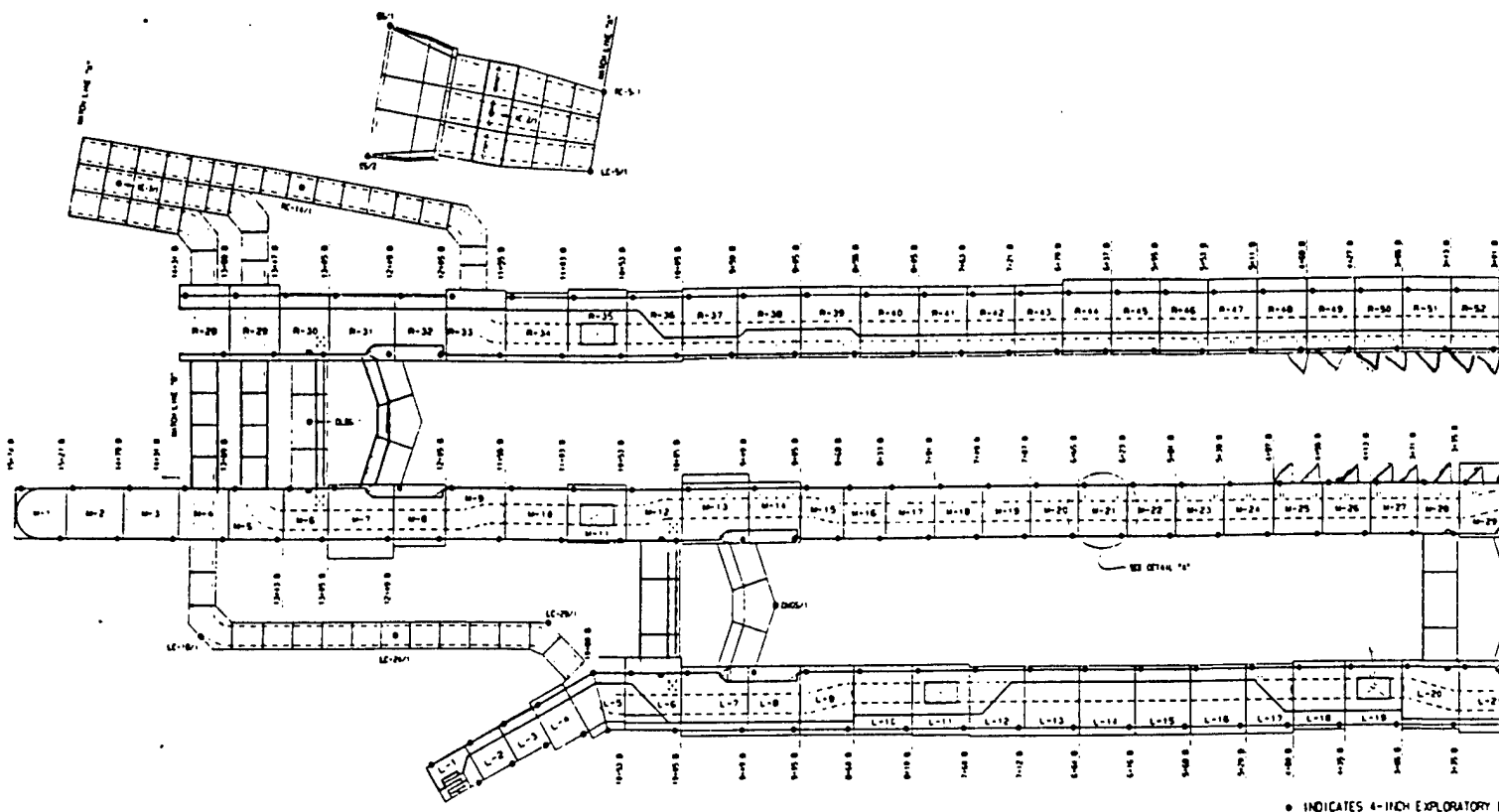
W. VA.  
(MASON COUNTY)

DESIGNED BY _____	OHIO RIVER GALLIPOLIS LOCKS AND DAM LOCKS  LOCATION PLAN SECTIONS AND BORINGS
DRAWN BY _____	
CHECKED BY _____	
SUBMITTED BY _____	
CHIEF DESIGN BRANCH _____	
APPROVAL RECOMMENDED _____	APPROVED _____ DATE _____
CHIEF ENG. DIVISION _____	COL. CE DISTRICT ENGINEER _____ AUGUST 1986
APPROVED FOR _____	SCALE 1" = 100'      CONTR 300 DRAWING NUMBER SHEET 0 OF 2 6B-10/1
DATE _____	

FOR INFORMATION PURPOSES ONLY 14-G-1







NOTE:  
M-21 SHOWN FOR INFORMATION  
PURPOSES ONLY

DETAIL "A"

SCALE: 1" = 10'-0"

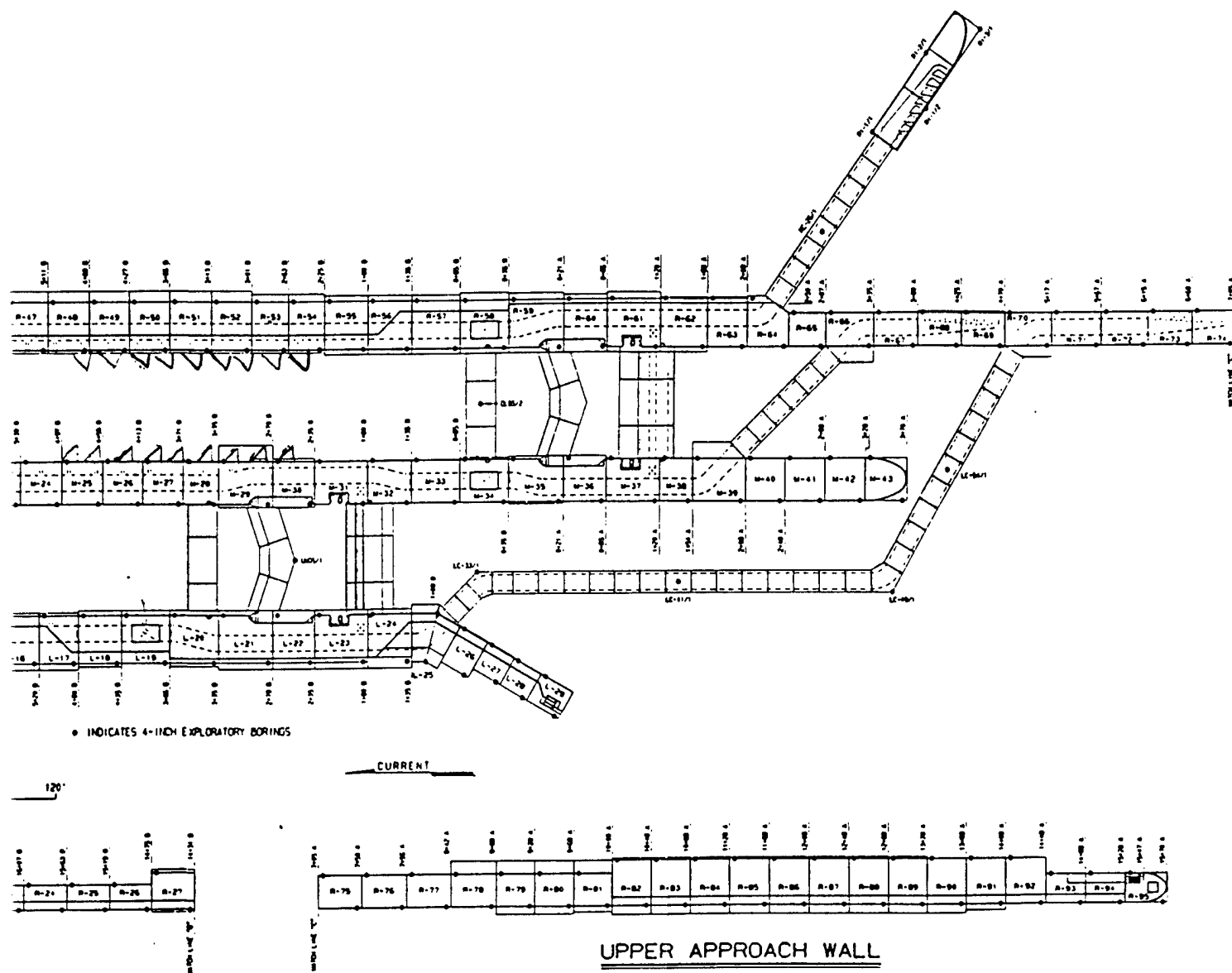
CURRENT

UNLESS OTHERWISE SHOWN, EXPLORATORY  
BORINGS ARE TO BE DESIGNATED AS FOLLOWS:  
MONOLITH NUMBER/1 --- RIVERSIDE OF MONOLITH  
MONOLITH NUMBER/2 --- LAKESIDE OF MONOLITH

DEPTH OF EXPLORATORY BORINGS

EXPLORATORY BORINGS TO EXTEND 20 FEET BELOW DESIGN  
BASE ELEVATIONS, SEE:

20/4	.....	LOWER APPROACH WALL
20/10	.....	RIVER WALL
20/40	.....	UPPER APPROACH WALL
20/45	.....	MIDDLE WALL
20/80	.....	LAND WALL
20/104	.....	RIVER WALL INTAKE MONOLITHS
20/135 THRU 20/136	.....	SILLS
20/140 THRU 20/148	.....	FILLING AND EMPTYING SYSTEM



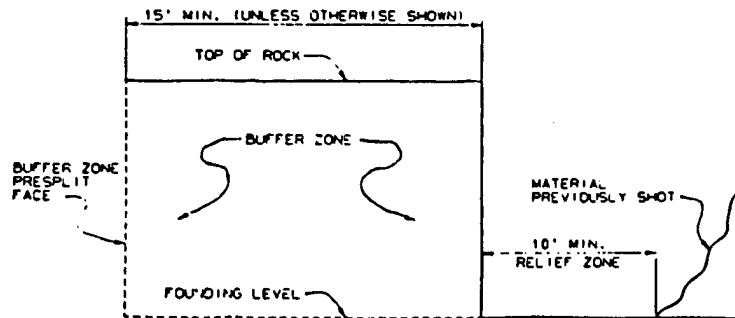
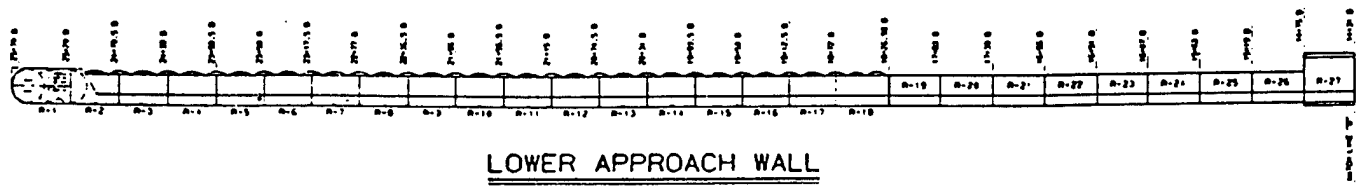
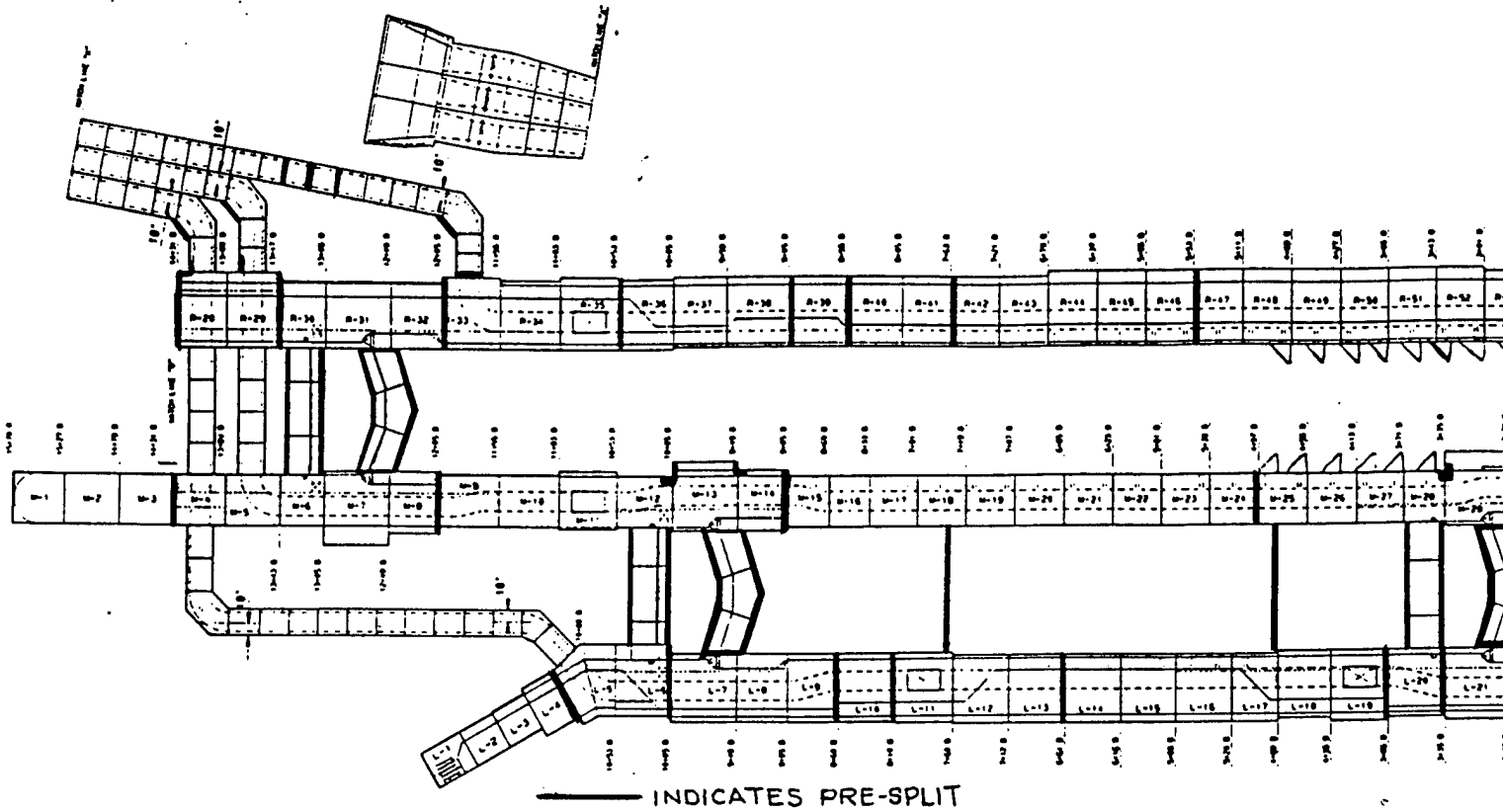
## RINGS

## EXPLORATORY NOTES

1. EXPLORATORY BORINGS SHALL BE 4-INCH SIZE.
2. EXPLORATORY BORINGS SHALL BE VERTICAL.
3. EXPLORATORY BORINGS SHALL BE DRILLED FROM THE TOP OF ROCK SURFACE PRIOR TO ANY ROCK EXCAVATION WITHIN 400 FEET OF THE HOLE LOCATION.
4. THE CONTRACTING OFFICER WILL DETERMINE THE NEED FOR ADDITIONAL DRILLING IN EACH HOLE BASED UPON THE AMOUNT OF CORE LOSS AND THE CONDITION OF THE SAMPLES RECOVERED.
5. HYDRAULIC PRESSURE TESTING SHALL COMMENCE AT THE BOTTOM OF THE HOLE AND PROGRESS UPWARD IN 5 FOOT INCREMENTS UNTIL THE TOP OF THE LAST INCREMENT TESTED IS 5 FEET ABOVE THE PROPOSED FOUNDATION ELEVATION AT THE HOLE LOCATION.
6. ANY HOLE WHICH PENETRATES MORE THAN TWO FEET OF INDURATED CLAY SHALL BE PRESSURE TESTED AND BACKFILLED WITH GROUT IMMEDIATELY UPON COMPLETION OF THE DRILLING.
7. THE CONTRACTING OFFICER MAY DIRECT THAT ADDITIONAL DRILLING BE PERFORMED AT ANY LOCATION WITHIN THE CONTRACTOR'S WORK LIMITS.
8. THE CONTRACTING OFFICER MAY AT ANY TIME ESTABLISH PRIORITIES FOR THE EXPLORATORY DRILLING. WHEN PRIORITIES HAVE BEEN ESTABLISHED, THE CONTRACTOR SHALL DRILL THE HOLES IN THE ORDER INDICATED UNTIL SUCH TIME AS THE PRIORITIES ARE CHANGED OR THOSE HOLES WITH PRIORITIES HAVE BEEN COMPLETED.

DESIGNED BY S.T.M. P.B.B.	DATE	DESCRIPTION
CHECKED BY C.H.P.		
SUBMITTED BY S.T.M. P.B.B.		
APPROVED BY S.T.M. P.B.B.		
APPROVED FOR		
U.S. ARMY ENGINEER DISTRICT, HUNTINGTON CORPS OF ENGINEERS HUNTINGTON, W.VA.		
OHIO RIVER GALLIPOLIS LOCKS AND DAM LOCKS IN CANAL EXPLORATORY DRILLING BORING LOCATION PLAN		
O-L26B-16/123		

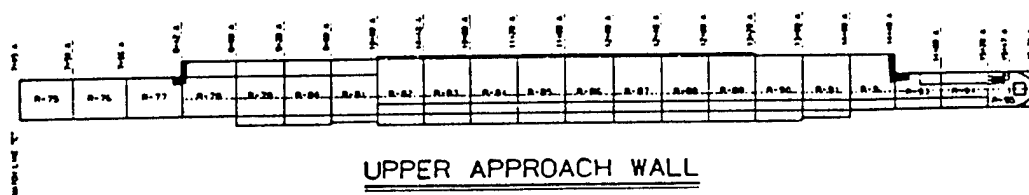
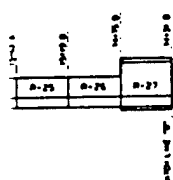
14-H-1



BUFFER ZONE DETAIL

NOT TO SCALE

**CURRENT**



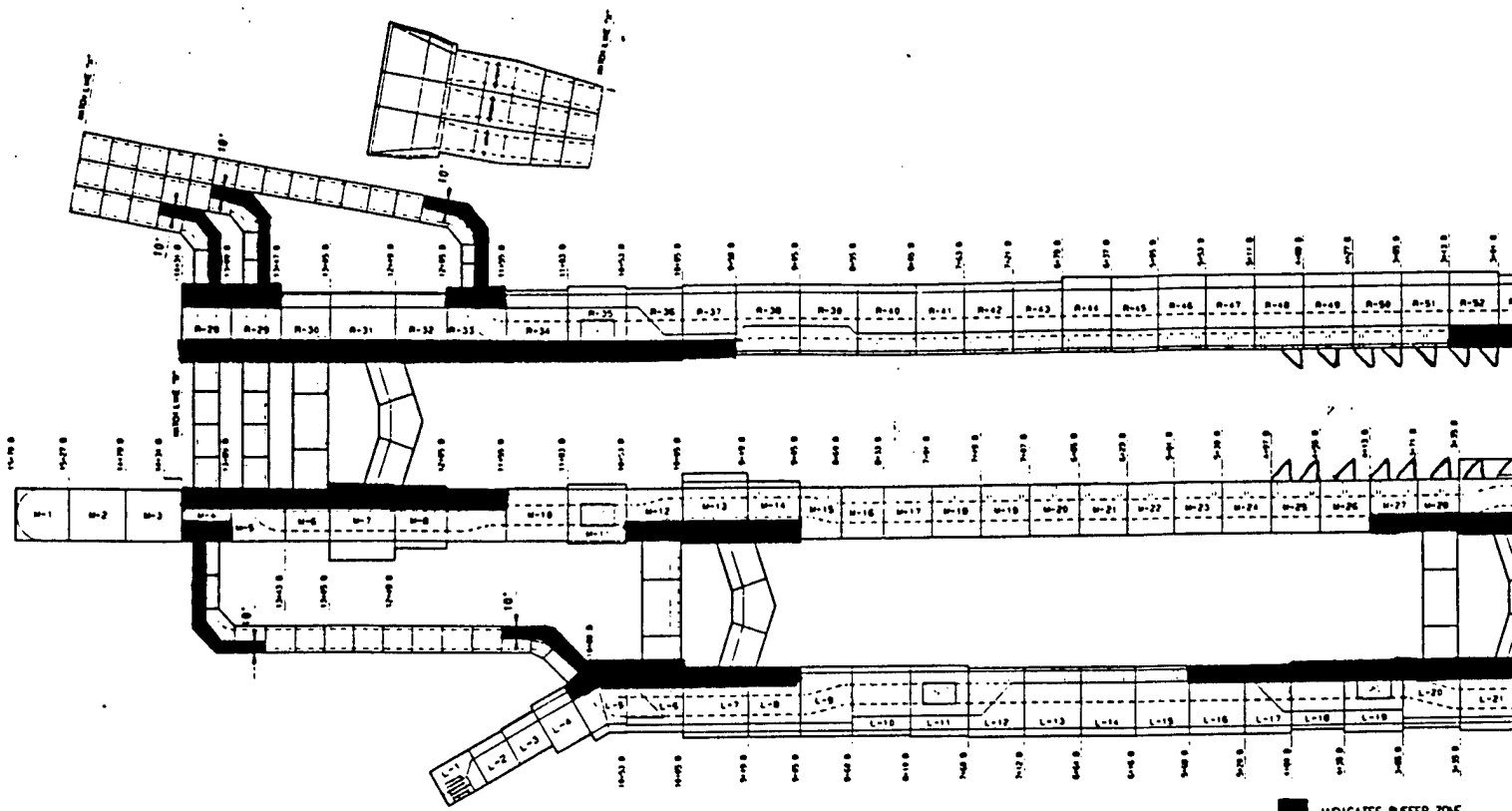
## NOTES

1. THE PERIMETER OF ALL STRUCTURAL EXCAVATIONS SHALL BE PRESALTY.
2. BUFFER ZONE TO EXTEND TO FULL DEPTH AND LENGTH OF MONOLITH WHERE SHOWN.
3. THE CONTRACTING OFFICER MAY DIRECT THAT BUFFER ZONE TECHNIQUES BE USED IN ADDITIONAL AREAS.
4. TENTATIVE FOUNDING ELEVATIONS MAY BE REVISED WHERE EXPLORATORY DRILLING REVEALS THE NEED.
5. WHERE BUFFER ZONE TREATMENT IS REQUIRED FOR BOTH WALLS OF A GIVEN MONOLITH, SEE SPECIFICATIONS.
6. FOR TENTATIVE FOUNDING ELEVATIONS SEE THE FOLLOWING SHEET NO'S:
 

20/1	-----	LOWER APPROACH WALL
20/10	-----	RIVER WALL
20/10	-----	UPPER APPROACH WALL
20/15	-----	MIDDLE WALL
20/80	-----	LAND WALL
20/104	-----	RIVER WALL INTAKE MONOLITHS
20/135 THRU 20/138	-----	SILLS
20/140 THRU 20/148	-----	FILLING AND EMPTYING SYSTEM

[illegible]

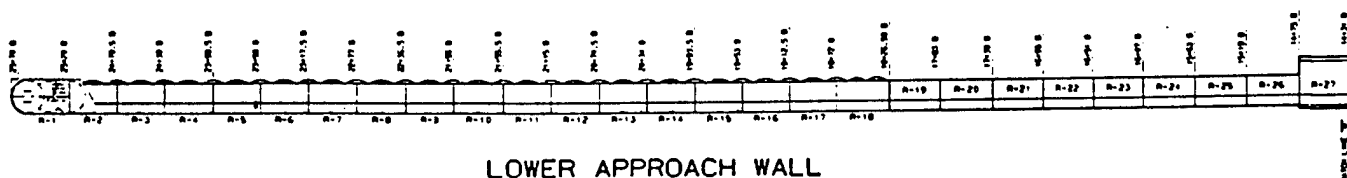
14-I-1



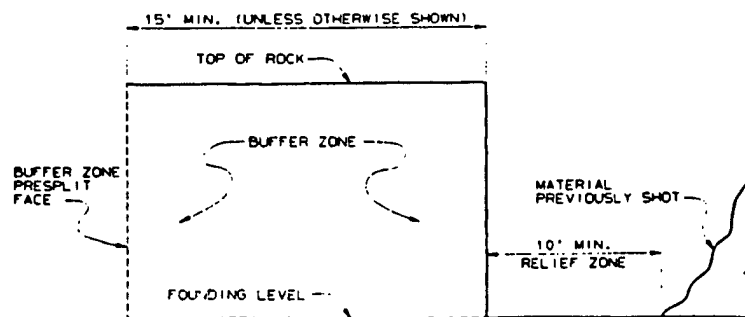
INDICATES BUFFER ZONE

PLAN

60' 30' 0' 60' 120'  
SCALE: 1" = 60'

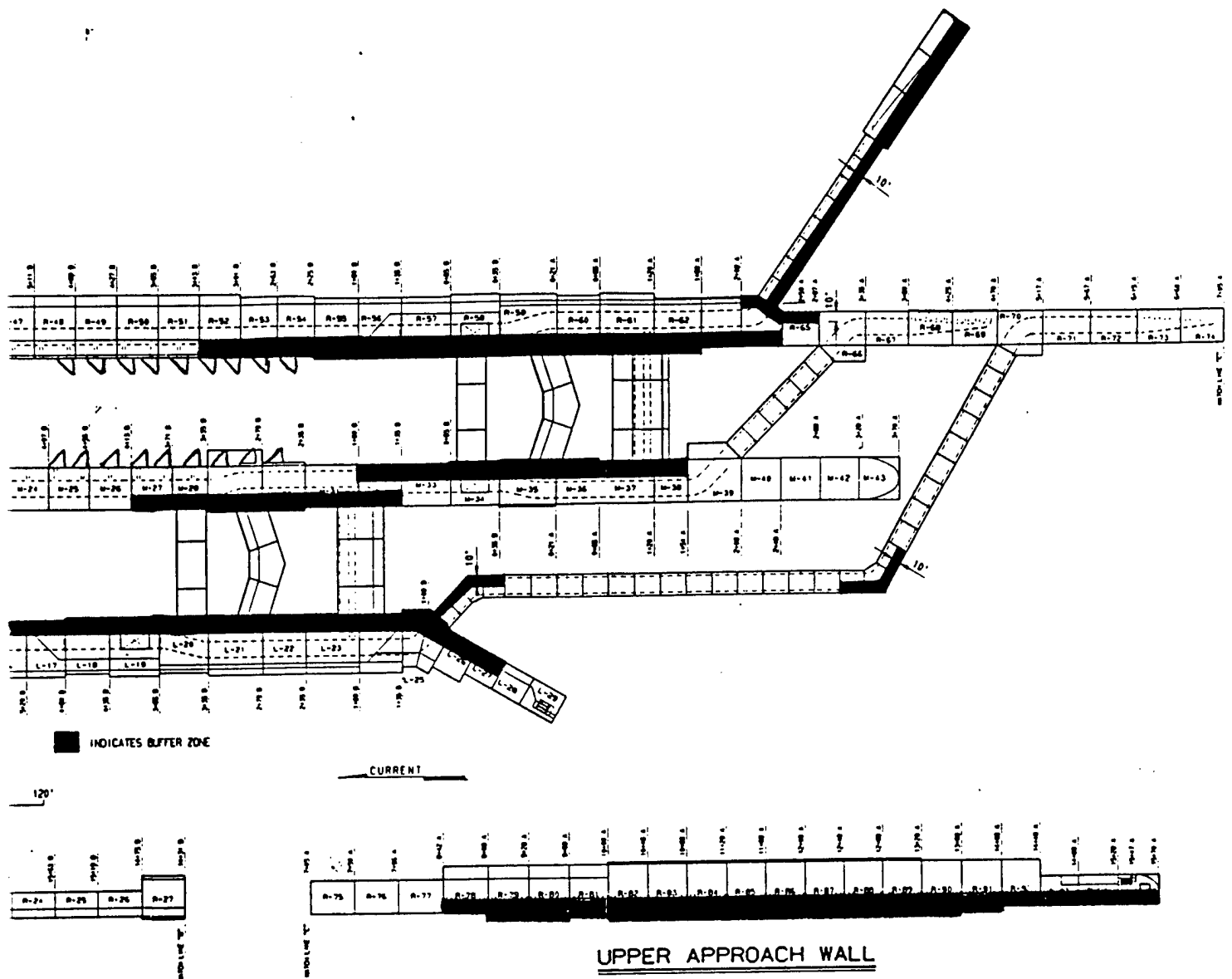


LOWER APPROACH WALL



BUFFER ZONE DETAIL

NOT TO SCALE



### NOTES

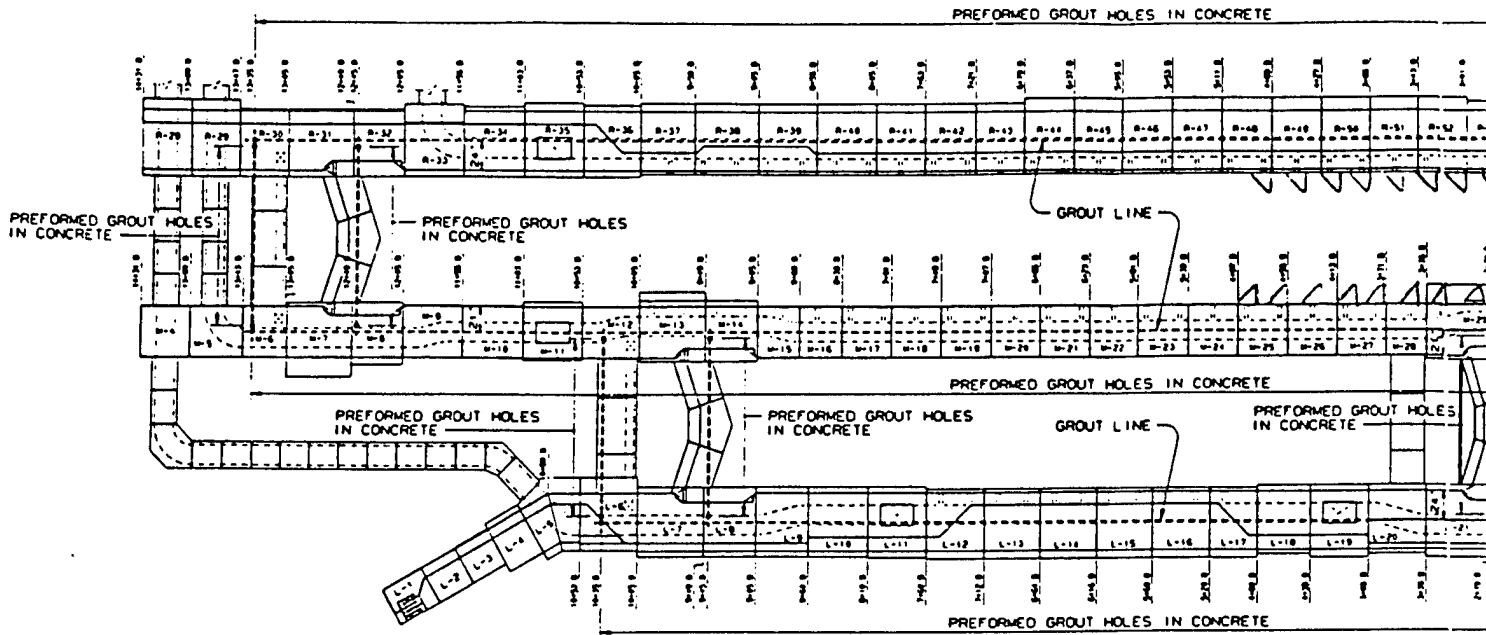
1. THE PERIMETER OF ALL STRUCTURAL EXCAVATIONS SHALL BE PRESPLIT.
2. BUFFER ZONE TO EXTEND TO FULL DEPTH AND LENGTH OF MONOLITH WHERE SHOWN.
3. THE CONTRACTING OFFICER MAY DIRECT THAT BUFFER ZONE TECHNIQUES BE USED IN ADDITIONAL AREAS.
4. TENTATIVE FOUNDING ELEVATIONS MAY BE REVISED WHERE EXPLORATORY DRILLING REVEALS THE NEED.
5. WHERE BUFFER ZONE TREATMENT IS REQUIRED FOR BOTH WALLS OF A GIVEN MONOLITH, SEE SPECIFICATIONS.
6. FOR TENTATIVE FOUNDING ELEVATIONS SEE THE FOLLOWING SHEET NO'S:
 

20/4	-----	LOWER APPROACH WALL
20/10	-----	RIVER WALL
20/40	-----	UPPER APPROACH WALL
20/45	-----	MIDDLE WALL
20/80	-----	LAND WALL
20/104	-----	RIVER WALL INTAKE MONOLITHS
20/135 THRU 20/138	-----	SILLS
20/140 THRU 20/148	-----	FILLING AND EMPTYING SYSTEM

<b>OHIO RIVER GALLIPOLIS LOCKS AND DAM LOCKS IN CANAL ROCK EXCAVATION PLAN</b>	
DESIGNED BY: S.T.M. R.D.B. DRAWN BY: L.N.P. L.E.B. CHECKED BY: S.T.M. R.D.B. SUBMITTED BY: APPROVAL RECOMMENDED: APPROVED FOR:	SYSTEM CONTROL DATA CORP., NOS 1.4 SOFTWARE: ICEDDDN VERSION 1.53 NOS 101: CEM111 FILE NAME: DG16124 RSN NO: A099EC U.S. ARMY ENGINEER DISTRICT, HUNTINGTON CORPS OF ENGINEERS HUNTINGTON, W.VA. DATE:
O-L26B-16/124	

②

14-J-1

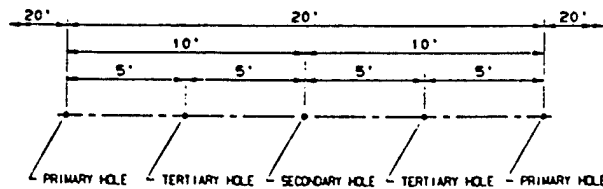


NOTE:  
SEE DETAIL "A"  
FOR DRILLING CRITERIA

### PLAN SHOWING LOCATION AND SPACING OF GROUT LINES

- PREFORMED HOLES IN CONCRETE ON 5' C. TO C.

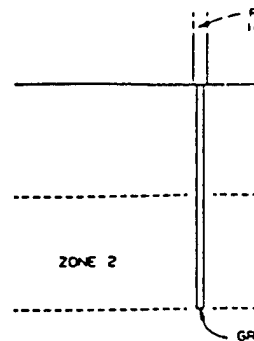
60' 30' 0 60' 120'  
SCALE: 1" = 60'



### DETAIL "A"

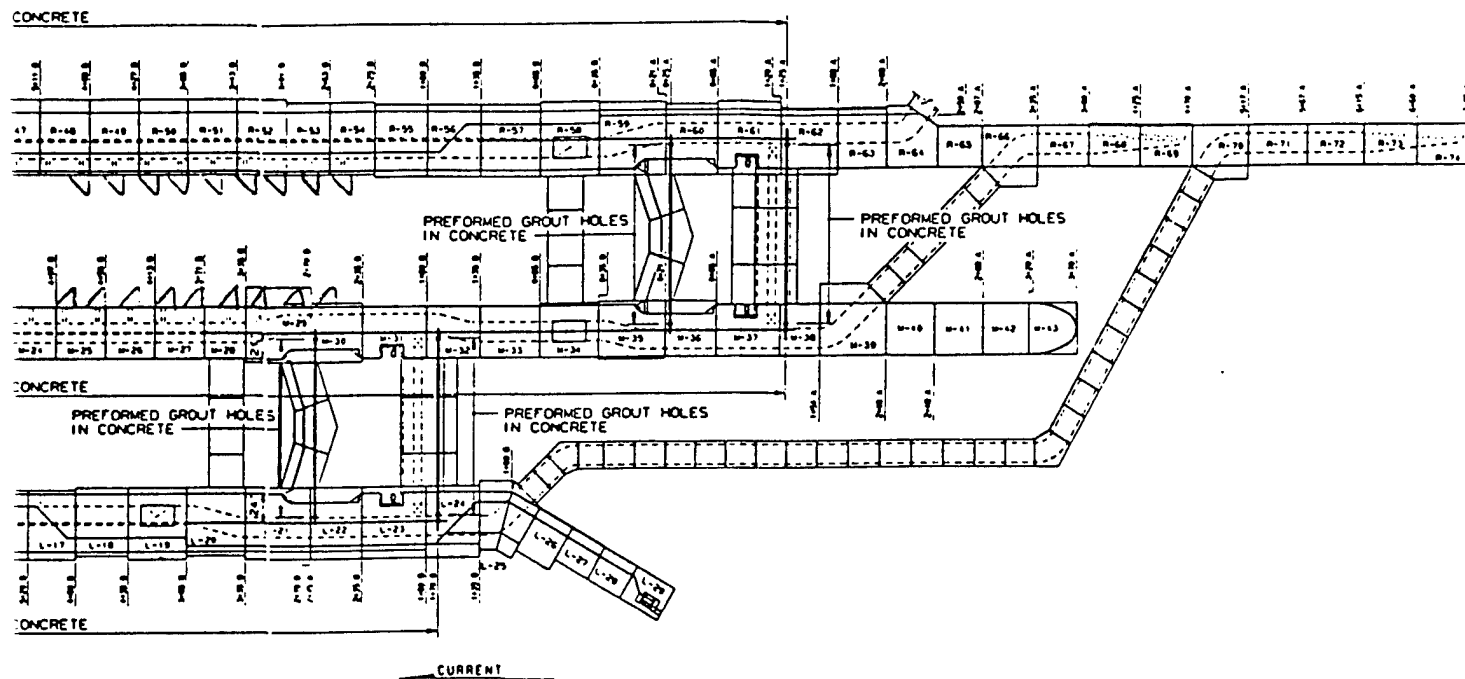
SCALE: 1" = 3'-0"

ALL PRIMARY AND SECONDARY HOLES TO BE DRILLED.  
THE NEED FOR DRILLING OF TERTIARY HOLES TO BE  
DETERMINED BY THE CONTRACTING OFFICER.



### TYPICAL GROUT

NR 1

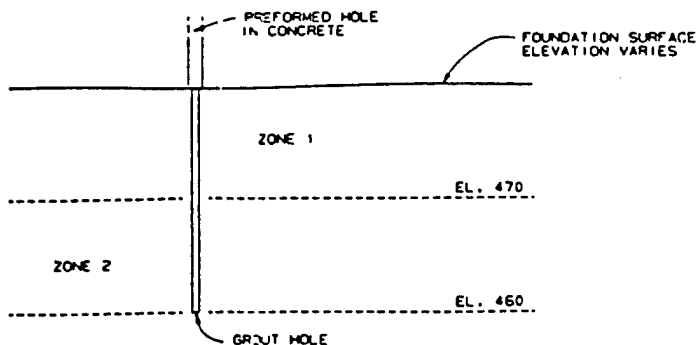


NOTE:  
SEE DETAIL "A"  
FOR DRILLING CRITERIA

## ND SPACING

3  
4

ON 5' C. TO C.



## TYPICAL GROUT HOLE DETAIL

NOT TO SCALE

## GROUTING NOTES

1. VERTICAL GROUT HOLES TO BE PREFORMED, 5" MAXIMUM C-C. NO PREFORMED HOLE SHALL BE LESS THAN 1.5' FROM ANY MONOLITH JOINT.
2. PRIMARY DRILLING TO BE ACCOMPLISHED THROUGH PREFORMED HOLES IN CONCRETE 20' C-C. SEE DETAIL "A".
3. MANDATORY SECONDARY DRILLING TO BE ACCOMPLISHED THROUGH PREFORMED HOLES IN CONCRETE TO SPLIT THE SPACING OF THE PRIMARY GROUTING. SEE DETAIL "A".
4. TERTIARY DRILLING, WHEN DETERMINED TO BE NECESSARY BY THE CONTRACTING OFFICER, SHALL BE ACCOMPLISHED THROUGH PREFORMED HOLES IN CONCRETE. SEE DETAIL "A".
5. HIGHER ORDER GROUTING TO BE ACCOMPLISHED THROUGH DRILLED HOLES WHERE AND AS DIRECTED BY THE CONTRACTING OFFICER. NO GROUT HOLE SHALL BE DRILLED LESS THAN 1.5' FROM ANY MONOLITH JOINT.
6. ZONE 1 GROUTING SHALL EXTEND DOWN TO ELEVATION 470. ZONE 2 GROUTING SHALL EXTEND DOWN TO ELEVATION 460.
7. ALL GROUTING IN CULVERT AREAS IS TO BE DONE FROM THE CULVERT INVERT. MITER GATE SILLS ARE TO BE GROUTED FROM THE TOP OF THE SILL, ELEVATION 492. IN OTHER AREAS, GROUTING SHALL NOT BEGIN UNTIL AT LEAST 10' OF CONCRETE HAS BEEN PLACED IN THAT MONOLITH AND ANY ADJACENT MONOLITHS.
8. GROUT LINES SHOWN WITH A DASHED LINE MAY BE DELETED BASED ON INFORMATION GATHERED DURING THE EXPLORATORY DRILLING AND THE GROUTING OF THOSE LINES SHOWN AS SOLID.

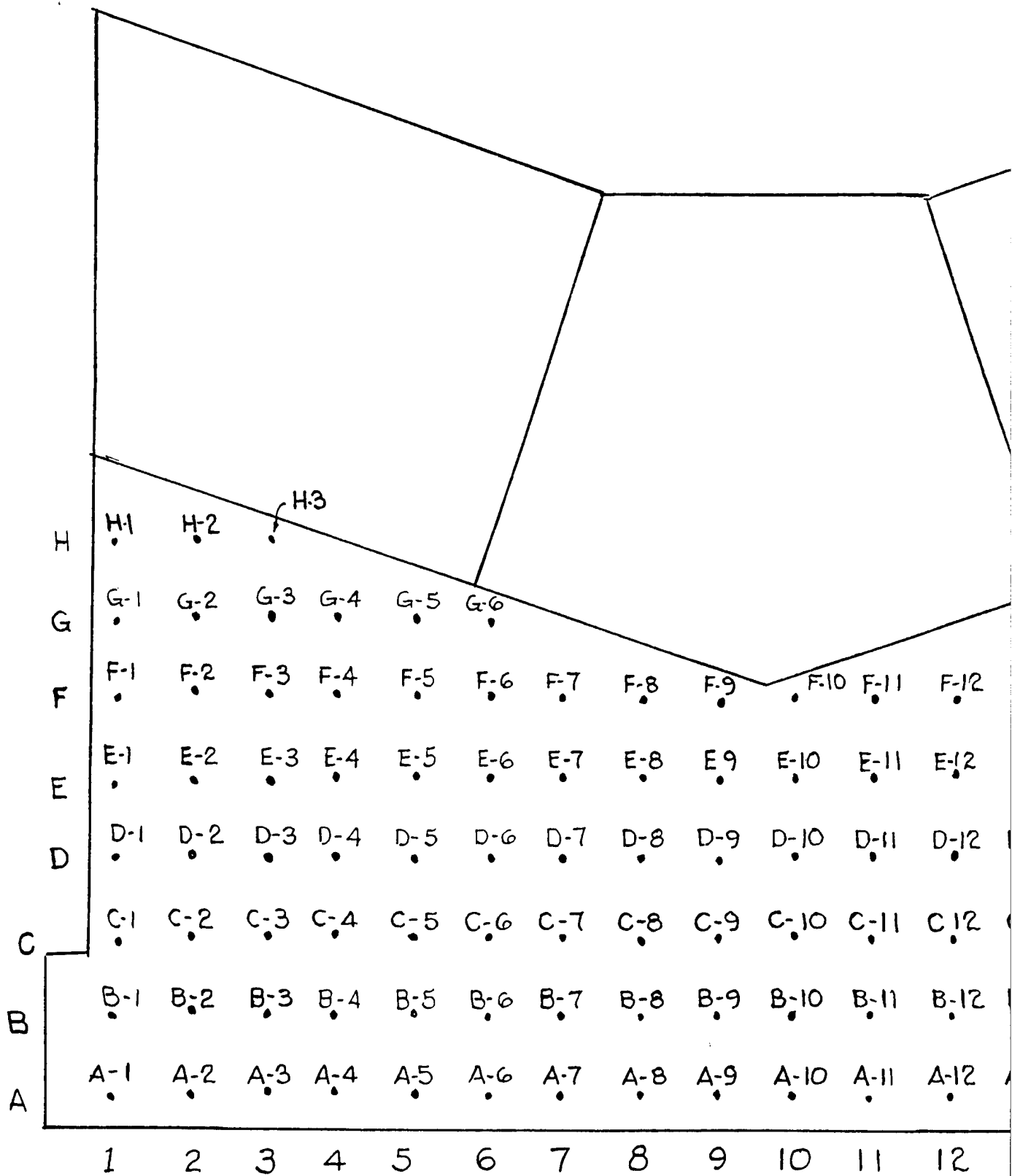
DESIGNED BY S.T.W. S.B.B.		DRAWN BY S.B.C. L.E.D.	
CHECKED BY S.T.W. S.B.B.		SUBMITTED BY	
SUPERVISOR S.T.W. S.B.B.		APPROVED S.T.W. S.B.B.	
DESIGN BRANCH		APPROVED S.T.W. S.B.B.	
APPROVAL RECOMMENDED		APPROVED S.T.W. S.B.B.	
APPROVED FOR		APPROVED S.T.W. S.B.B.	

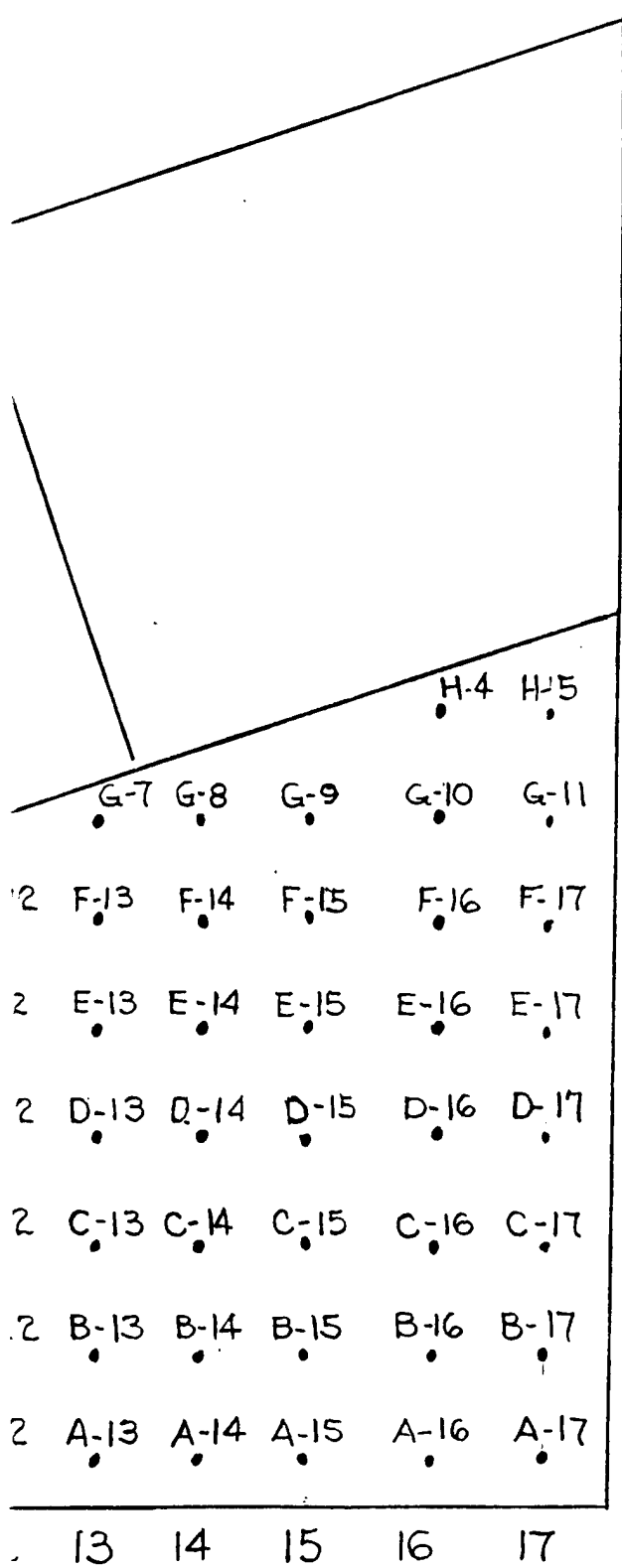
U.S. ARMY ENGINEER DISTRICT, HUNTINGTON  
CORPS OF ENGINEERS  
HUNTINGTON, W.VA.

OHIO RIVER  
GALLIPOLIS LOCKS AND DAM  
LOCKS IN CANAL  
FOUNDATION GROUTING

14-K-1

O-L268-16/125



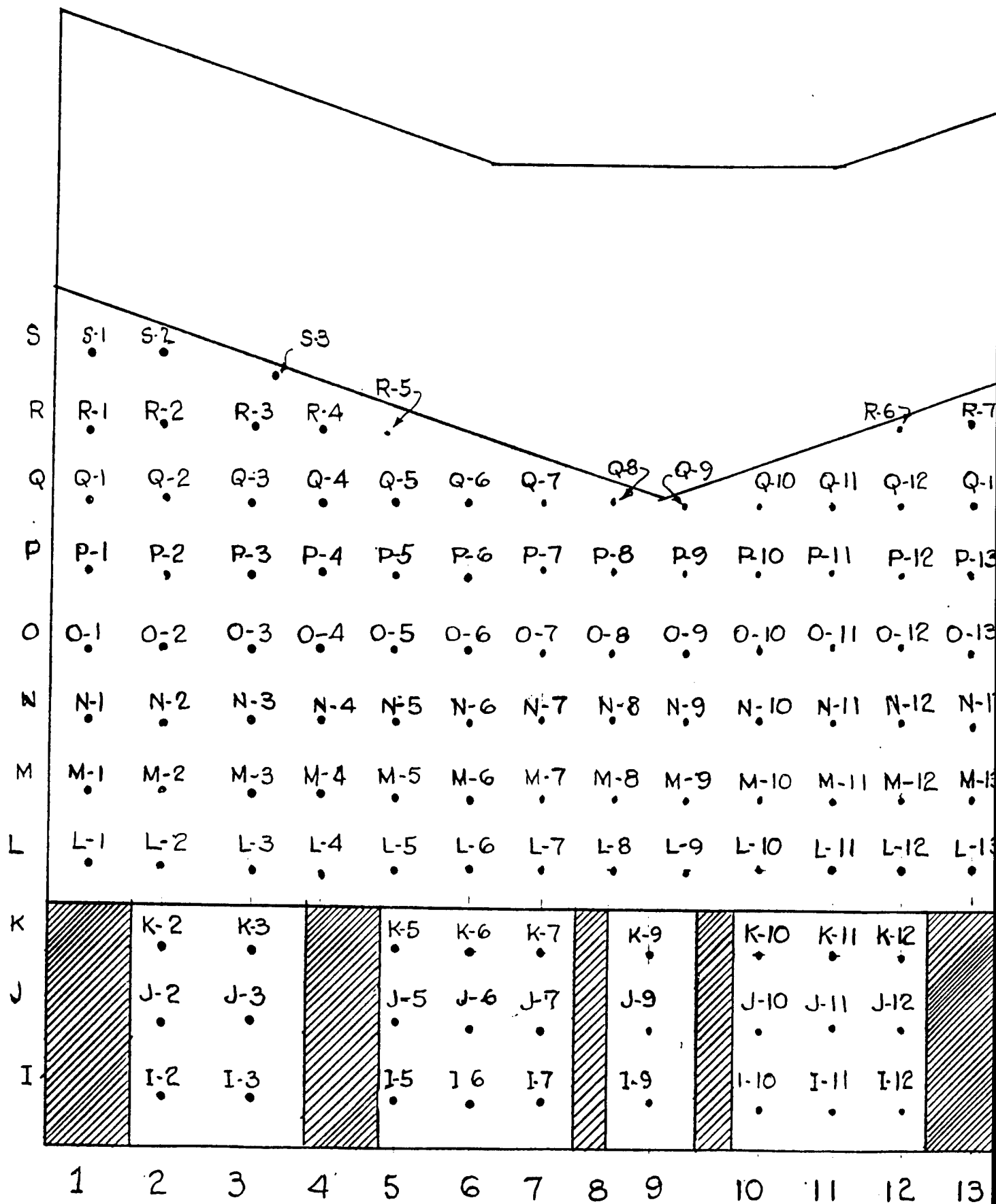


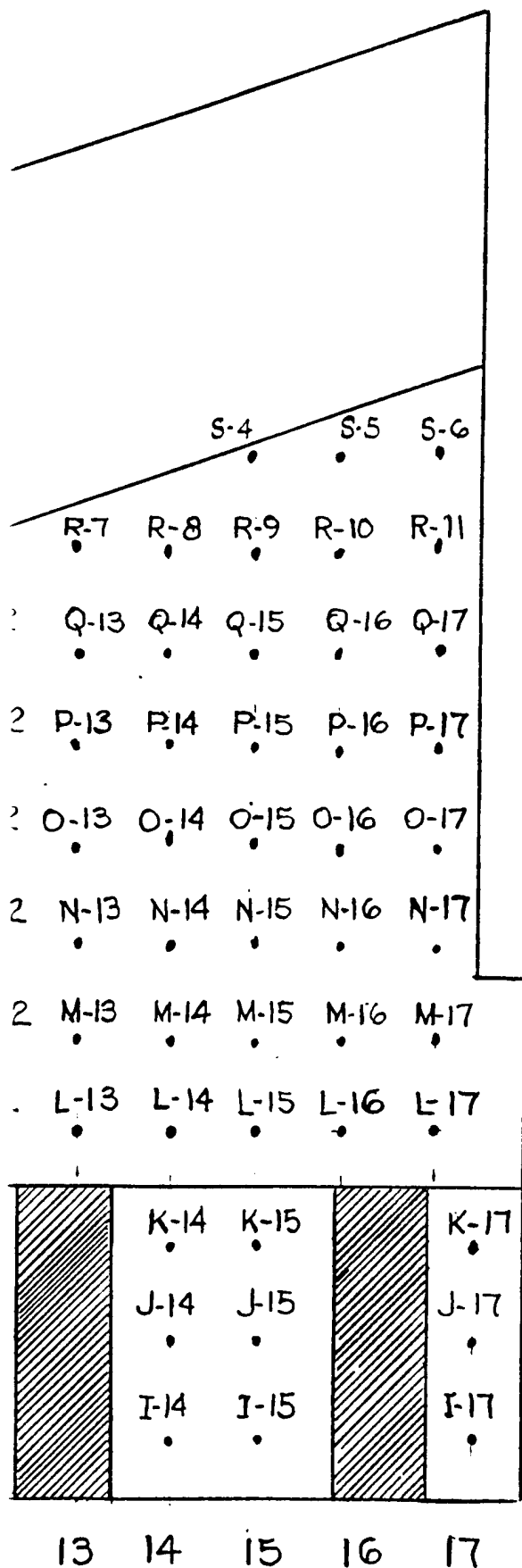
CURRENT

Gallipolis Lock and Dam  
 Lock in Canal  
 Weep Holes  
 Main Chamber  
 Lock Floor Pavement

2

14-L-1





CURRENT

Gallipolis Lock and Dam

Lock in Canal

Weep Holes

Auxiliary Chamber  
Lock Floor Pavement

(A)

14-M-1

(X)

(V) M-19 (T)

(R) M-20 (P) M-21 (N)

X-1 X-21	V-1 V-21	T-1 T-21	R-1 R-21	P-1 P-21	N-1 N-21
X-2 X-22	V-2 V-22	T-2 T-22	R-2 R-22	P-2 P-22	N-2 N-22
X-3 X-23	V-3 V-23	T-3 T-23	R-3 R-23	P-3 P-23	N-3 N-23
X-4 X-24	V-4 V-24	T-4 T-24	R-4 R-24	P-4 P-24	N-4 N-24
X-5 X-25	V-5 V-25	T-5 T-25	R-5 R-25	P-5 P-25	N-5 N-25
X-6 X-26	V-6 V-26	T-6 T-26	R-6 R-26	P-6 P-26	N-6 N-26
X-7 X-27	V-7 V-27	T-7 T-27	R-7 R-27	P-7 P-27	N-7 N-27
X-8 X-28	V-8 V-28	T-8 T-28	R-8 R-28	P-8 P-28	N-8 N-28
X-9 X-29	V-9 V-29	T-9 T-29	R-9 R-29	P-9 P-29	N-9 N-29
X-10 X-30	V-10 V-30	T-10 T-30	R-10 R-30	P-10 P-30	N-10 N-30
X-11 X-31	V-11 V-31	T-11 T-31	R-11 R-31	P-11 P-31	N-11 N-31
X-12 X-32	V-12 V-32	T-12 T-32	R-12 R-32	P-12 P-32	N-12 N-32
X-13 X-33	V-13 V-33	T-13 T-33	R-13 R-33	P-13 P-33	N-13 N-33
X-14 X-34	V-14 V-34	T-14 T-34	R-14 R-34	P-14 P-34	N-14 N-34
X-15 X-35	V-15 V-35	T-15 T-35	R-15 R-35	P-15 P-35	N-15 N-35
X-16 X-36	V-16 V-36	T-16 T-36	R-16 R-36	P-16 P-36	N-16 N-36
X-17 X-37	V-17 V-37	T-17 T-37	R-17 R-37	P-17 P-37	N-17 N-37
X-18 X-38	V-18 V-38	T-18 T-38	R-18 R-38	P-18 P-38	N-18 N-38
X-19 X-39	V-19 V-39	T-19 T-39	R-19 R-39	P-19 P-39	N-19 N-39
X-20 X-40	V-20 V-40	T-20 T-40	R-20 R-40	P-20 P-40	N-20 N-40

(Y)

(W)

(U)

(S)

(Q)

(O)

(M)

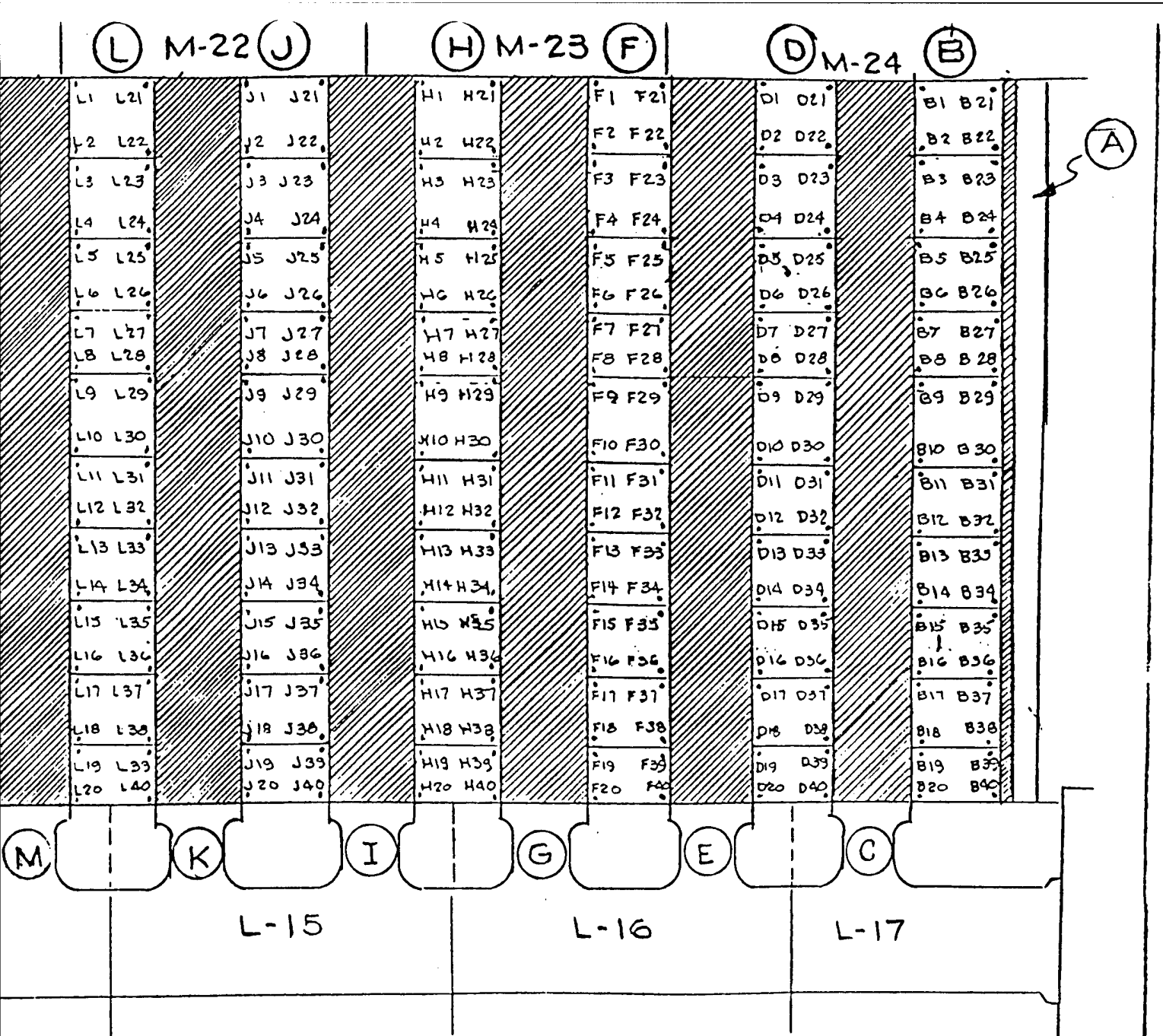
L-12

L-13

L-14

CURRENT

(1)



Gallipolis Lock and Dam

Lock in Canal

Weep Holes

Auxiliary Chamber  
Lock Laterals

14-N-1